

Town Branch Watershed Management Plan Executive Summary

November 2011



**MISSOURI
DEPARTMENT OF
NATURAL RESOURCES**

The project was partially funded by the U. S. Environmental Protection Agency Region 7, through the Missouri Department of Natural Resources, under Section 319 of the Clean Water Act.

Bolivar Community Watershed Improvement Group (BCWIG)

Who Is BCWIG?

BCWIG is a local non-profit organization made up of local residents representing a broad section of this community. This non-regulatory and voluntary organization was formed in 2005 to address the water quality issues impacting the Bolivar and its surrounding areas.

Mission Statement

The purpose of BCWIG is to restore and enhance water quality conditions of the Town Branch watershed in order to improve and sustain the quality of life for the Bolivar and Polk County area.

What Activities Does BCWIG Do?

BCWIG implements its goals through water quality monitoring, educational and restoration activities. BCWIG is in the process of writing a watershed management plan that will provide a guide for the community in protecting its water resources. This planning initiative is being funded through a grant provided by the Missouri Department of Natural Resources.

Who is Assisting BCWIG?

Different organizations and volunteers are assisting BCWIG and are helping out in the planning process. Cooperators such as the Polk County Health Department, City of Bolivar, Bolivar School District, University of Missouri Extension, Natural Resources Conservation Service and numerous landowners and citizens are helping BCWIG to begin protecting the water resources of Bolivar and Polk County.

How Can I Get Involved?

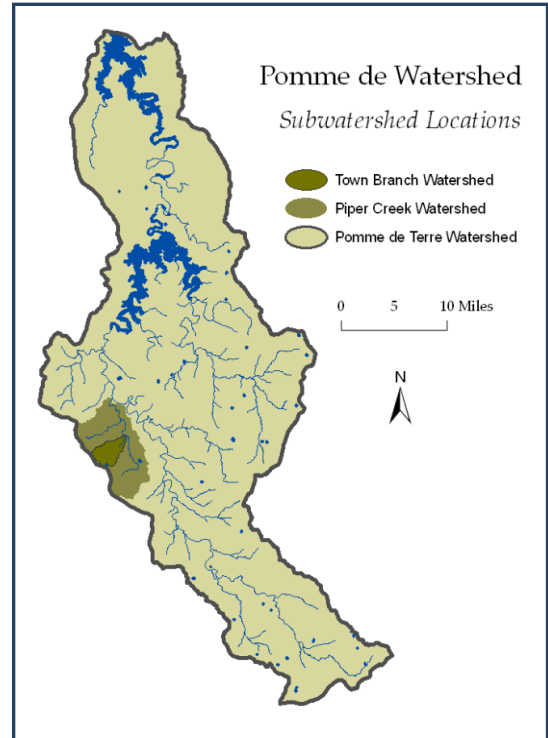
Feel free to contact BCWIG through its Chairman Delbert Simpson at 326-4694 or Sam Kirby at 777-8020 in order to volunteer, express concerns or just to learn how to protect water quality. Monthly meetings are held on the third Tuesdays of each month in the City of Bolivar council chambers.

What is a Watershed?

A watershed is a geographical area in which water from rainfall or snowmelt drains to certain waterbody such as a creek, river or lake.

In What Watershed Is Bolivar?

The majority of Bolivar is located in the Town Branch watershed. Town Branch is the stream that flows through Bolivar and eventually drains into Piper Creek just east of town. Piper Creek eventually flows into the Pomme de Terre River. Thus the Town Branch Watershed is part of the Piper Creek watershed and the Pomme de Terre watershed. The Town Branch watershed encompasses approximately 3,800 acres.



Why is it Important to Protect Watersheds?

Everyone utilizes water for some purpose or another-whether for health, recreational or industrial purposes. Protecting the quality of water protects our economic and environmental investment for the future.

What Problems Does the Town Branch Watershed Have?

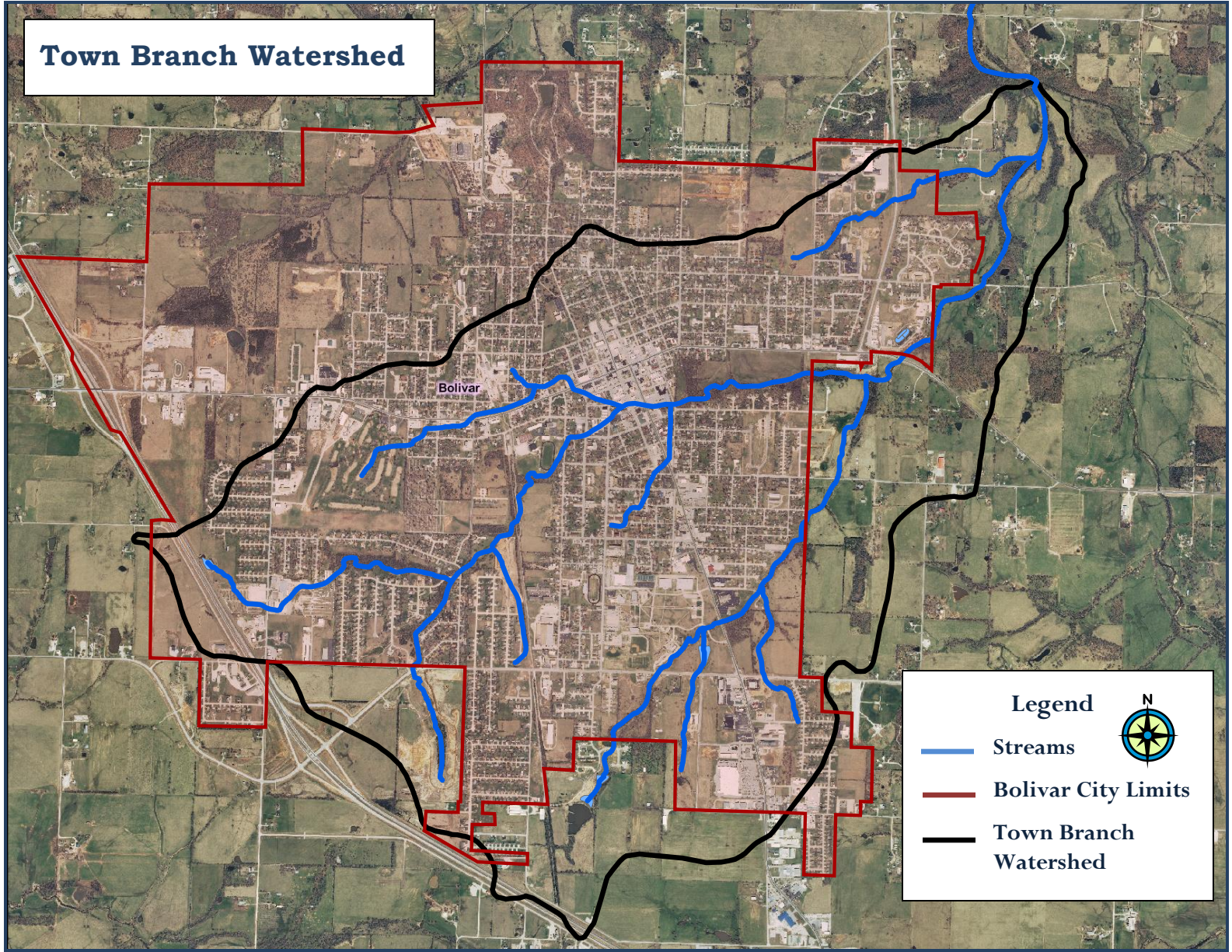
The Town Branch watershed is an urbanized watershed. It is under the influence of urban storm water runoff which severely impairs water quality and quantity conditions. Such conditions include increased nutrient and bacteria levels, stream bank erosion, heavy metal contamination, trash accumulation and flooding events.



Trash Debris



Flooding





Town Branch Watershed Management Plan

Mission Statement

To create a comprehensive and strategic watershed plan in order to serve as a guide to improve and sustain the water quality resources of Town Branch and Piper Creek.



Community Project sponsored by BCWIG



Educational Booth Display

Executive Summary of the Town Branch Watershed Management Plan

Background

The Bolivar Community Watershed Improvement Group (BCWIG) is a local non-profit organization made up of local residents representing a broad section of this community. This non-regulatory and voluntary organization was formed in 2005 to address the water quality issues impacting Bolivar and its surrounding areas. The purpose of BCWIG is to restore and enhance water quality conditions of the Town Branch watershed in order to improve and sustain the quality of life for the Bolivar and Polk County area. BCWIG implements its goals through water quality monitoring, educational and restoration activities.

In 2008, BCWIG received a Clean Water Act, Section 319 watershed management planning grant from the Missouri Department of Natural Resources through the United States Environmental Protection Agency-Region VII. The purpose of this grant (and subsequent report) is to assess water quality impairment sources in the Town Branch watershed and to develop a comprehensive plan to address, reduce and deter further impairment. The Town Branch watershed is a tributary of Piper Creek which is designated as an impaired waterbody by the EPA through the Clean Water Act, Section 303(d) for waterways not meeting water quality standards. Because of this, a Total Maximum Daily Load (TMDL) was established by United States Environmental Protection Agency in order to determine a level necessary to achieve applicable water quality standards. This TMDL process will be incorporated into the overall watershed management plan for Town Branch.

The watershed management planning process was achieved through a cooperative effort led by BCWIG with the assistance of many organizations and citizens. Public input meetings were held to discuss water quality issues and protection measures. Monthly meetings of BCWIG were also held to prioritize monitoring, planning, educational and restoration activities. This report will coalesce information that was generated over the past three years of this watershed planning process while providing guidance for future watershed protection activities.



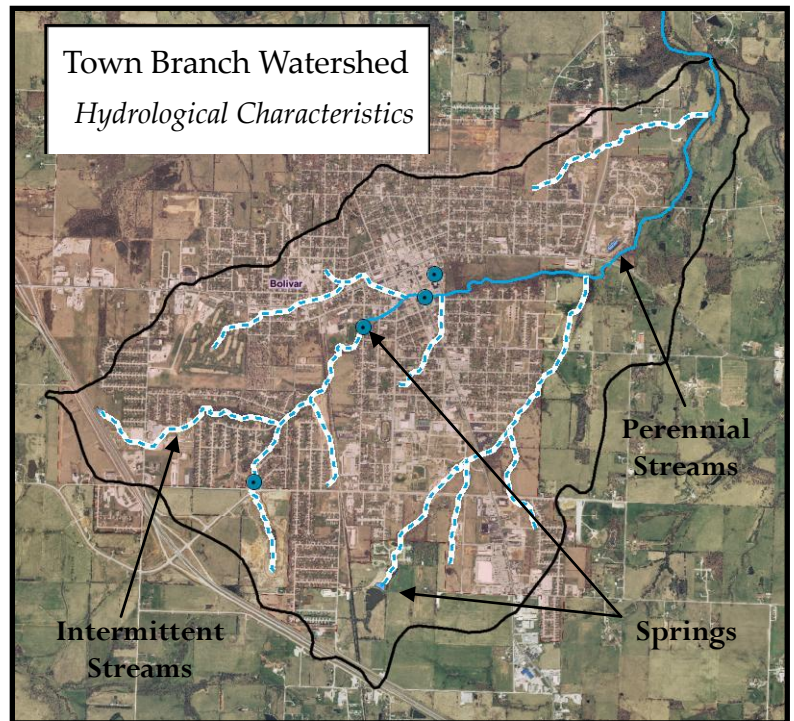
BCWIG Volunteers

Watershed Location and Land Use

The Town Branch watershed is predominately located within the city limits of Bolivar Missouri. Encompassing over 3,800 acres, this waterbody drains into the Piper Creek watershed of the larger Pomme de Terre River watershed. Positioned as the seat of Polk County, Bolivar is the economic, educational and cultural center of this county and nearby region. In 2010, Bolivar's population of 10,325 increased at a 12.93% rate over the past ten years. New development and industry is increasing due to the high quality of life this region offers. The Town Branch watershed is predominately an urban watershed with 67.6% being identified as urban land cover.

Water Resources Assessment

Town Branch has 12.2 miles of stream within its watershed. Approximately 21 % of the delineated streams have permanent flow. Permanent flow is supplied from various springs and subsurface flow emanating from the shallow aquifer system. Many of the springs that once existed have since ceased to flow. Many of the historical springs were used as drinking water sources for the residential use. However due to non-point source pollution (namely from the lack of sanitary sewers and animal waste), many had to be abandoned due to environmental health concerns.



Town Spring

Town Branch also has small percentage of wetlands. Wetlands are areas that exhibit subsurface groundwater discharge and are classified by having permanent and/or seasonal water with hydric soils and certain types of aquatic fauna and flora. Examples of wetlands include springs, creeks, rivers and ponds. The total area of the wetlands in the Town Branch watershed equate to 23.08 acres or less than one percent of the total watershed area. The majority of the wetlands in this watershed are lake/pond wetlands. There are two delineated emergent wetlands. Emergent wetlands are characterized by erect, rooted, herbaceous shrubs and hydrophytes. This vegetation is present for most of the growing season. These wetlands are usually dominated by perennial plants and are seasonally flooded.

Riparian Conditions

A riparian area is the interface between land and a stream. Riparian areas can act as a buffer in protecting the health and integrity of a stream if it is properly managed. Riparian buffers help to protect stream bank stability while mitigating temperatures, providing wildlife habitat and acting as filter for polluted runoff.

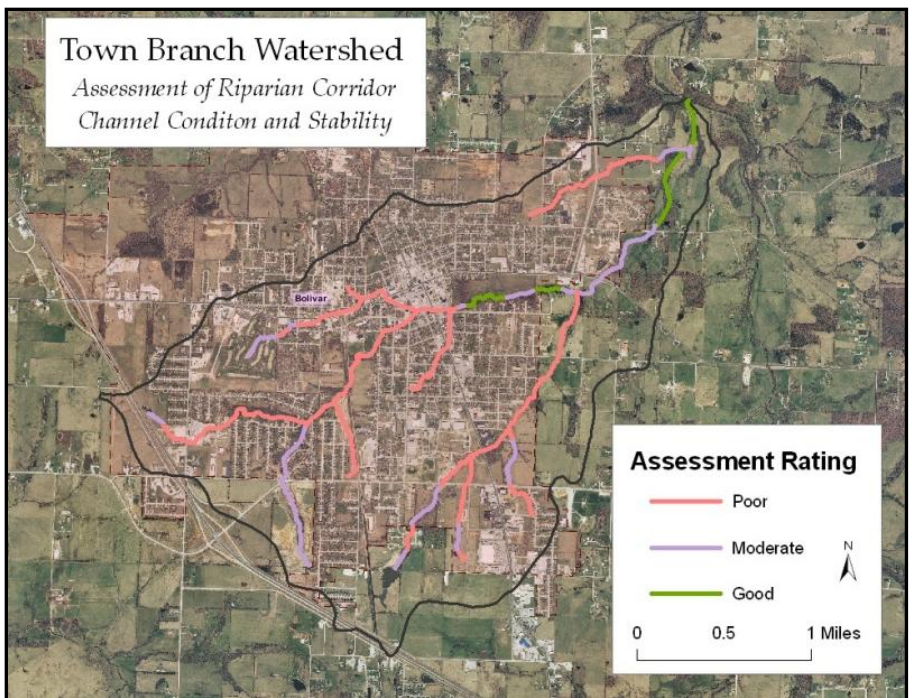


Good Riparian Area



Poor Riparian Area

Based on a study conducted by the Natural Resources Conservation Service in conjunction with Drury University, approximately 40% of the Town Branch watershed has an adequate riparian corridor with 60% being inadequate. This study assessed the riparian corridors of the Town Branch watershed based upon certain attributes such as condition (diversity and health of flora, degree of succession) and width of the vegetative buffer.



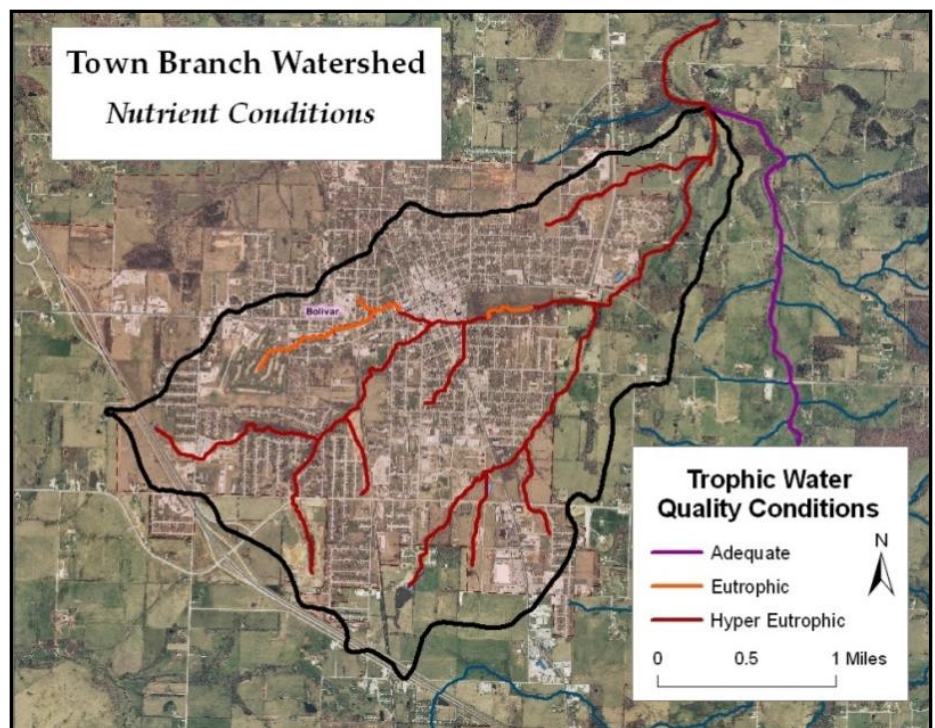
Streambank stability and geomorphic features (bedload, scouring) were also assessed. Most of the riparian corridors that were deemed inadequate have little or no riparian buffer and exhibited signs of active erosion. Many of these sites have connected impervious areas leading into the channel or were levied in the past for flood control.

Water Quality Conditions

Water quality conditions in the Town Branch watershed have been regularly monitored since 2006 by the Polk County Health Department. The physical, chemical and biological attributes that were monitored include temperature, pH, dissolved oxygen, conductivity, turbidity, phosphorus, and nitrogen and macroinvertebrate diversity.

Since the TMDL focused on total phosphorus, total nitrogen and total suspended solids, the water quality data will help to delineate areas of nutrient impacts. Nutrient levels within the Town Branch watershed play an important factor in impacting the trophic state of water quality conditions. Trophic water quality conditions refer to the overall level of nutrients and related algae/plant growth within a water body. There are various types of trophic states. Mesotrophic conditions exist where there are intermediate levels of nutrient supplies. Eutrophic conditions are systems that have a large supply of nutrients that proliferate algal production. Hypereutrophic conditions exhibit large concentrations of nutrients to where algae and aquatic plants become a major nuisance.

Nutrient levels of both phosphates and nitrates indicated a strong correlation with land use, riparian conditions and point and non-point sources. The lowest levels of nutrients were monitored on Piper Creek before its confluence with Town Branch. Though the upper Piper Creek watershed is mainly agriculture, it can be correlated that a significant amount of nutrient loading does not come from this area. This could be due to the passive land use of haying grassland and the proper management of agricultural operations such as livestock exclusion from waterways, proper fertilization techniques/manure handling and riparian corridor protection.



Piper Creek/Town Branch TMDL

Piper Creek is listed on the Missouri Department of Resources 303(d) List for Impaired Waterbodies due to high levels of organic sediment. Section 303(d) of the federal Clean Water Act requires that each state identify waters that are not meeting water quality standards and for which adequate water pollution controls have not been required. Water quality standards protect such beneficial uses of water as whole body contact and secondary contact recreation, maintaining fish and other aquatic life, and providing drinking and processing water for people, wildlife, livestock and industry. The 303(d) list helps state and federal agencies keep track of waters that are impaired but not addressed by normal water pollution control programs.

The area of impairment in this watershed begins on the southern Town Branch section starting from Springfield Avenue and flowing into Piper Creek. This impairment continues for the duration of Piper Creek (approximately 7.5 miles) until its confluence with the main stem of the Pomme de Terre River.

In order to address the sources of impairment, a Total Maximum Daily Load (TMDL) was calculated. A TMDL is a term in the Clean Water Act, describing a value of the maximum amount of a pollutant that a body of water can contain while still meeting water quality standards. Alternatively, TMDL is an allocation of that water pollutant deemed acceptable to the subject receiving waters.

From the information generated through assessment, monitoring and modeling techniques, the identified source of impairment is listed as the City of Bolivar Waste Water Treatment Facility and other unknown sources. Evidence supports that the other unknown sources are emanating different point and non-point sources. The pollutants identified and subsequently addressed in the TMDL are nutrients (total phosphorus and total nitrogen), sediment (total suspended sediment), and low dissolved oxygen.

Point sources refer to any discernible, confined or discrete conveyances, such as drainage pipes, channels and conduits, by which pollutants are transported to a water body. These sources are typically regulated by a local, state or federal authority due to the concentration and level of pollutants being discharged.

Non-point sources include generalized contributors of pollutants that emanate from non-discernible sources that are difficult to measure. Such areas include runoff from agriculture and urban areas, on-site wastewater systems and degraded channel and riparian conditions such as stream bank erosion. Due to the size and complexity of these sources, they are typically not regulated but are addressed through education, the implementation of local standards and cost-share assistance.

Water Quality Concerns & Issues

On October 22, 2009 a public stakeholder meeting (sponsored and facilitated by BCWIG and the University of Missouri Extension) was held to discuss water quality issues and concerns for the Town Branch watershed. The purpose of this meeting was to identify and prioritize a list of concerns that would help give guidance for the community in implementing water quality practices and programs for deterring water quality threats. Further meetings were held to finalize action measures and Best Management Practices (BMPs) that would be applicable to implement throughout the Town Branch watershed. Though these action measures and BMPs will be discussed later, it is important to note that this is a guide. While some of these issues are currently being addressed, it may take many years for other issues to be addressed. However the first step is to identify the concerns and needs of the citizens in order to protect water quality.

Issue	Concerns/Needs
Future Development	<ol style="list-style-type: none"> 1. Planning for future growth. 2. Having a reliable storm water infrastructure system. 3. Increase amount of public space and establish greenway system.
Storm Water Infrastructure	<ol style="list-style-type: none"> 1. Need for better sediment and erosion control. 2. Need for disconnecting impervious areas. 3. Need for increasing infiltration through open spaces. 4. Need for detaining and retaining storm water. 5. Need for creating stream buffer zones and setbacks.
Waste Water Infrastructure	<ol style="list-style-type: none"> 1. Deter infiltration of storm water runoff into sanitary sewers. 2. Convert on-site waste water systems to sanitary sewer system.
Homeowner/Commercial Influences	<ol style="list-style-type: none"> 1. Deter over-fertilization of lawns. 2. Need for better landscape design and planning to capture runoff. 3. Need to enlighten citizens about the importance of water quality.
Town Branch Attributes	<ol style="list-style-type: none"> 1. Streambanks are in poor condition and have a lack of vegetation. 2. Need to address trash, debris and environmental health concerns. 3. Need to incorporate flood control with water quality.
Water Conservation	<ol style="list-style-type: none"> 1. Educate landowners about lawn watering practices. 2. Have an emergency water conservation plan during droughts.
Agricultural Operations	<ol style="list-style-type: none"> 1. Recognize the need and benefits of agricultural land uses. 2. Promote agricultural BMPs and related cost-share programs. 3. Promote urban agricultural garden operations/markets.

Action Measures

In order to address and achieve the load reductions calculated in the before mentioned TMDL, certain management measures will have to be implemented over time. These management measures include implementing best management practices as well as developing an outreach and monitoring strategy.

Best Management Practices

Best management practices (BMPs) are structural and non-structural components and procedures that can be implemented throughout a watershed to deter the impacts from non-point source pollution. In order to preserve the natural water quality of the Town Branch watershed, BMPs need to become general knowledge and applied through education, voluntary adoption and technical oversight.

Structural BMPs include practices that are implemented on the land such as the construction of storm water controls (forebay-detention basins, grassed swales, bio-retention cells, rain gardens, etc.), establishing riparian corridors/buffers and the utilization of advancing technological systems (water/oil separators, permeable pavement, centrifugal sediment separators, etc.).



Rain Barrel

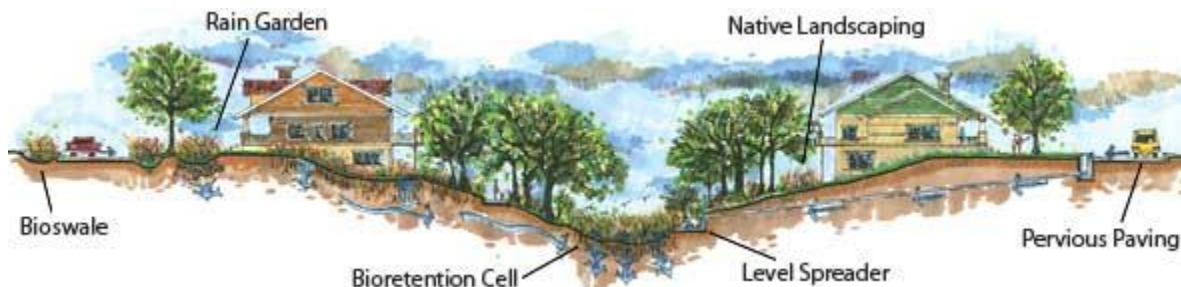


Parking Lot Bio-Retention Cell



Rain Garden

Non-structural BMPs focus on non-physical practices such as education, planning, zoning and community development. These methods are typically less costly than structural practices. Examples include ordinances designed to preserve open space or create stream buffer setbacks as well as cost-share programs that help landowners implement structural BMPs.



Outreach Program & Strategy

Education and outreach activities are designed to inform the public on BMPs and conditions that relate directly to improvement of water quality within the watershed. Many avenues for outreach are available to residents of the watershed. Organizations such as the Natural Resources Conservation Service, Soil and Water Districts, Missouri Department of Conservation, University of Missouri Extension, Polk County Master Gardeners Program, City of Bolivar and the Polk County Health Department provide much needed information to landowners regarding BMPs and give technical advice on practices or services that will benefit the land and water quality in the watershed.

The Bolivar Watershed Improvement Group is an excellent organization that works with various groups to implement watershed protection projects and goals. Being a non-profit and non-regulatory organization, BCWIG is the natural organization to facilitate the work between agencies and residents of the watershed.

The following list identifies educational opportunities that will be used to improve water quality education in the watershed.

1. Continue/sustain BCWIG coordination and funding for watershed management activities.
2. Publish a water quality newsletter and create/host a BCWIG website.
3. Implement a public awareness campaign with public service announcements.
4. Implement and host educational workshops for landowners and businesses.
5. Host local watershed festivals.
6. Cooperate with local educational institutions and schools.



Stream Table Demonstration



Town Branch Stream Clean-up

Monitoring Program & Strategy

Continued monitoring of the Town Branch/Piper Creek watershed will be integral in better understanding the dynamics of this watershed as well as evaluating the effectiveness of implemented action measures. It has been determined from existing evaluations and studies that there is general lack of water quality information in this watershed. A specific monitoring program will help to further define action measures and management strategies.

Currently, BCWIG and the Polk County Health Department monitor Town Branch through the Stream Team program. However, it has been determined by the Monitoring Committee of BCWIG that monitoring should be expanded and focused on two areas: TMDL studies and bacteria source tracking.

TMDL Monitoring

Since the TMDL addresses Total Phosphorous, Total Nitrogen and Total Suspended Solids; it will be imperative to monitor for these constituents. The information generated will help cooperators to further delineate and address the sources contributing to nonpoint pollution. Monitoring for these constituents will also be complementary to the city of Bolivar's stormwater management program. Most importantly, a TMDL monitoring program will also help to cooperators evaluate the effectiveness of implemented best management practices.

Bacteria Source Tracking

Bacteria source tracking is a method that identifies and delineates certain signatures of fecal coliform in order to determine its source whether it originates from human, bovine, equine or other mammalian sources. This is very useful in watershed studies that have mixed urban and agricultural land uses. By further defining the nonpoint source, it is very useful in helping resource managers in addressing the particular source identified.



Town Branch Stream Team



Monitoring on Town Branch

Acknowledgments

Planning, design and implementation of the Town Branch Watershed Management Plan would not have been possible without the participation of the Bolivar Community Watershed Improvement Group (BCWIG) and its valued supporters and partners. Through their vision and diligence, this plan will be a valuable resource for current and future watershed protection efforts. Such noted supporters and partners include the City of Bolivar, Polk County Commission, Polk County Health Department and the Natural Resources Conservation Service.

Special appreciation is given to Delbert Simpson, past chairman of BCWIG who facilitated the organization of this group as well as providing the leadership in attaining the planning grant to write this watershed management plan. Appreciation and remembrance is also given to the late Anne Peery of Missouri Department of Natural Resources-Water Pollution Control Program who assisted BCWIG in its formation and who was instrumental in guiding BCWIG throughout the TMDL process. We would also like to recognize John Johnson, nonpoint project officer of the Missouri Department of Natural Resources-Water Pollution Control Program whose guidance, oversight and patience in this process is greatly appreciated. We would also like to thank Bob Broz and Dan Downing of the University of Missouri Extension-Water Quality Program for assisting BCWIG throughout this watershed planning process. Special gratitude is also given to Drury University-Environmental Programs for assisting BCWIG in the assessment phase of this plan.

We acknowledge the persistence, dedication and valuable work of the individuals listed below. They represent the foundation on which this plan was built. Finally we would like to thank Sam Kirby of BCWIG whose organization and management skills have kept its members and cooperators informed and committed to the mission of BCWIG as well as Adam Coulter, NRCS Water Quality Conservationist -South Missouri Water Quality Project, whose extraordinary abilities with plan development, input coordination and unique resource knowledge have been invaluable in the creation of this plan.

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