Chapter 5: Find Solutions - Exploring BMP Options

5.1 Introduction

In watershed planning, a best management practice, or BMP, is traditionally defined as something built on the ground with documentable results in reducing nonpoint source pollution (pollution from diffuse sources). The phrase is also used to refer to other practices designed to improve water quality. Targeted BMP implementation is vital to successful watershed planning.

BMPS may be:

- Structural – these BMPs require construction, installation, and maintenance. They're usually BMPs that one can see such as stream buffers, rain gardens, and silt fences.
- Nonstructural – these BMPs involve changes in activities or behavior in people. Examples include education or events like watershed meetings and creek cleanups.

Figure 5.1: Examples of structural best management practices.

BMPs can greatly improve water quality. Curb cuts in roads (top left) capture stormwater to decrease runoff pollution. Trees help prevent erosion and reduce instream water temperatures (top right). Riparian (vegetative) buffers near waterways (bottom right) improve habitat and catch pollutants before they enter the water. Silt fences (bottom left) reduce erosion and keep sediment out of waterways.

There are all kinds of BMPs to address all sorts of issues. Because everything we do on the land affects the water, most types of land use have associated best management practices. BMPs can address agricultural issues like erosion and manure management, residential issues like failing septic systems and stormwater runoff, construction issues like erosion, and many others. In watershed planning, there should be a direct link between a specific, identified watershed issue and the proposed BMP that will help alleviate that issue.

Education and protection practices are BMPs, too. Education can be very effective at mitigating water quality issues and is recommended for many aspects of this project. Riparian buffers, conservation easements, groundwater, source water, and wellhead protection plans, and agricultural water quality plans are BMPs that safeguard good water quality. It's often more practical and economical to protect good water quality than to improve poor water quality.

5. 2 Best Management Practices

With the source identification and prioritization from Chapter 4, knowledge gathered from community members, and background information presented in Chapter 2, we can select BMPs to recommend for future implementation in the Red River Watershed. Table 5.1 is a recap of which sub-watershed areas need BMPs for specific issues.

Table 5.1: BMPs needed in each project sub-watershed.

	Sampled for water chemistry	Sampled habitat and biology	*E. coli*	Total Suspended Solids	Total Phosphorus	Conductivity	Protection
Swift Camp Creek	Yes = 4 sites	Yes = 4 sites	All sites need reduction	Yes = 3 sites	All sites need reduction	All sites need reduction	All sites need protection
Indian Creek	Yes = 3 sites	Yes = 3 sites	No	No	All sites need reduction	Yes = 2 sites need reduction	All sites need protection
Gladie Creek	Yes = 1 site	Yes = 1 site	No	No	Site needs reduction	No	Site need protection
Clifty Creek	No	Yes = 1 site	n/a	n/a	n/a	n/a	Site needs protection

All of the following BMPs have the potential to address specific pollutant issues in the sub-watershed studied in this plan. The BMPs are grouped by which water quality issue/pollution source they may help mitigate. In Chapter 6, feasibility factors like economics, stakeholder

cooperation, regulatory matters, political will, and other watershed management activities are considered to help select the recommended BMPs for the watershed.

Education and Planning BMPs

Education may be the most effective type of BMPs because it is the collective daily actions of watershed residents that have the biggest impact on water quality and habitat.

Education on watershed issues and nonpoint source pollution – Education, both formal and informal, on water quality issues, nonpoint source pollution, and watershed protection may help to improve community understanding of water issues and thereby mitigate issues.

Conservation easements - A conservation easement is a voluntary agreement that allows a landowner to limit the type or amount of development on their property while retaining private ownership of it. An easement can be used to help establish healthy riparian areas, shield land from development, or protect parcels of land to maintain or improve watershed health.

Creek Cleanups – Getting together as a community to pick up trash from roads, hillsides, and waterways can help drive home the message that what we do on the land affects the water. It also helps remove solid waste from waterways.

Groundwater Protection Plans – A groundwater protection plan (GPP) identifies activities at a site that have the potential to pollute groundwater and defines BMPs used to protect groundwater. A GPP implements actions that protect groundwater for all current and future uses, and when it is implemented properly prevents groundwater pollution.

Wellhead and Source Water Protection Plan - The 1986 amendments to the Safe Drinking Water Act required states to develop a wellhead protection program (WHPP) to protect public water supplies using groundwater as the water source. This regulation requires that counties develop water supply plans that assess the quantity of water used by public water systems and create protection plans for source waters used by those systems. WHPP is designed to assist communities relying on groundwater as their source to develop groundwater protection plans.

Planning and zoning – Review of local ordinances that affect water quality issues like riparian buffer protection on public and commercial properties, illegal garbage dumps near the creek, storm water issues, future development, and others.

Wastewater BMPs

Septic system improvements may help reduce the amount of *E. coli* and Total Phosphorus in the waterways. BMPs dealing with sewer lines are not eligible for nonpoint source pollution funding, but the watershed team could pursue alternate funding for these types of initiatives.

Education about septic issues – This BMP could be implemented in a variety of ways and tailored to different audiences. Educational materials about proper septic system maintenance could be mailed to households outside of sewer line service area, used in public service announcements, discussed at community meetings and events, and otherwise distributed.
Financial assistance for septic system pump outs – Financial assistance could be provided to help homeowners have their septic systems inspected and pumped.

Financial assistance for septic system repair or replacement – Financial assistance could be provided to help homeowners repair or replace their septic system. This BMP may reduce bacteria, total phosphorus, and conductivity issues originating from failing septic systems.

Financial assistance for sewer line repairs and/or extension – Addressing inflow and infiltration issues in Campton could help mitigate bacteria, total phosphorus, and conductivity issues originating from failing or absent sewer lines in Swift Camp Creek. Additionally, a sewer line extension may alleviate bacteria issues originating from failing or absent septic systems.

Riparian buffer establishment – Riparian areas are those areas directly adjacent to waterways. Establishing a buffer of plants around a waterway, also known as a filter strip, can help improve the health of the water in many ways. One important way a riparian buffer can help is by catching and filtering out pollutants that would otherwise flow into the water during or after a rain event. Another way is by stabilizing creek banks with plant roots. And another way is by providing shade for the water and its inhabitants. Riparian buffers can be effective on farms, suburban yards, and in towns. Riparian buffers could help mitigate *E. coli*, total phosphorus, and conductivity issues originating from various sources in the project areas.

Sewer line updating – In Campton, inflow and infiltration issues with the existing sewer and drinking water lines has been documented. Fixing or updating these lines may provide a significant reduction in *E. coli*, Total Phosphorus, and Conductivity issues.

Sewer line extension – Septic systems, when installed and maintained properly, are acceptable for waste disposal. When a community cannot maintain systems properly, however, bacteria can be a public health and environmental issue. An extension of the sewer line from Campton to the rest of the watershed may eliminate failing septic systems or straight pipes.

Stormwater BMPs

Stormwater pollution is rain or snowmelt that cannot sink into the ground, and so it runs off. This can be a significant problem in developed areas like Campton because as the water runs off and into the nearest waterway, it carries with it contaminants from roads, sediment from construction sites, yards, and farms, trash from streets and parking lots, and many other types of pollution. There is also an issue with too much water reaching the wastewater treatment plant and maximizing capacity in heavy rains. When this happens, wastewater can be discharged directly to Swift Camp Creek.

Education about stormwater pollution – Educational materials about stormwater pollution can be effective at getting the word out on the value of capturing stormwater at homes and businesses. Education could focus both on reducing and eliminating degrading substances like lawn fertilizer or oil drips in the driveway and on capturing stormwater runoff to keep those substances out of waterways.

Green infrastructure design
Incorporating green infrastructure design into new city planning or retrofitting it into existing structures can help to mitigate the amount of rain that runs off of impervious surfaces and become stormwater pollution. There are numerous design options from easy fixes like rain barrels to more complicated projects like green roofs and pervious pavement.

Silt Fences – installing a temporary fence to keep disturbed soil at construction or other land disturbance sites from running off site helps keep soil out of nearby waterways.

Riparian buffer establishment

Conductivity
As discussed in Chapter 4, sources of conductivity in these watersheds likely include failing septic systems, failing sewer line infrastructure, and manure from livestock. Sediment from development or agricultural sources may also be a source.

Silt Fences

Financial assistance for septic system repair or replacement

Financial assistance for sewer line repairs and/or extension

Riparian buffers

Sewer line extension

Sewer line updating

Agricultural BMPs
Agriculture in the watershed is not extensive. However, for those existing operations, there are BMPs that may mitigate sources of sediment from row crops and livestock as well as *E. coli* and Total Phosphorus from livestock. Local conservation districts can provide expert advice and information about existing programs to promote responsible agriculture. They may also be a source of state cost-share funding. To qualify for state cost-share funding, landowners must first complete or update an existing Agricultural Water Quality Plan.

Agricultural Water Quality Plans - The Kentucky General Assembly passed the Kentucky Agriculture Water Quality Act in 1994. The goal of the act is to protect surface and groundwater resources from pollution as a result of agriculture and silviculture (forestry) activities.

The Agriculture Water Quality Act requires all landowners with 10 or more acres that are being used for agriculture or silviculture operations to develop and implement a water quality plan based upon guidance from the Kentucky Agriculture Water Quality Plan. It is the sole responsibility of each landowner to develop, implement and revise when needed, a water quality plan for their individual operations.

The Kentucky Agriculture Water Quality Plan is a compilation of BMPs from six different areas: silviculture, pesticides and fertilizers, farmstead, crops, livestock and streams and other waters. Each BMP includes definitions and descriptions, regulatory requirements, Agriculture Water Quality Authority requirements, design information, practice maintenance, technical assistance, cost-share assistance, recommendations and references.

Habitat BMPs

The habitat issues covered in Chapter 4 indicate that all areas covered in the plan would benefit from habitat improvement BMPs.

Stream restoration - Restoring a section of a stream to recreate habitat functions or help alleviate flooding can improve overall water quality and habitat in a watershed.

Wetlands – Restoring or creating a wetland can be a huge boon for water quality and habitat improvement. It entails establishing wetland hydrology, vegetation, and wildlife habitat functions on soils capable of supporting those functions. This can be done as a class project and/or an educational as well as a hydrological project.

Trail improvements – Improving trails to limit the amount and severity of erosion may help to improve water quality. Trail improvements may include installing water bars or rolling grade dips, rerouting low lying and frequently flooded spots, temporarily or permanently closing trails to allow vegetation to regrow, and education the trail users about these changes.

Riparian buffer establishment

Conservation easements

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Note that point sources of pollution like discharge from wastewater treatment plants, sewer line leakages, or permitted discharges (a rock quarry, for example) are not eligible for work with 319 nonpoint source grants, but could be addressed by the watershed team via alternate funding or volunteer work. Funding for this project and other KDOW Nonpoint Source Section grants may only fund BMPs for nonpoint source pollution.

5.3 Individual Sub-watershed Planning

Swift Camp Creek

Swift Camp Creek and an unnamed tributary to Swift Camp Creek are impaired waterways. Swift Camp Creek needs improvement in many water quality parameters and habitat (see Table 5.2). Load reductions are needed for total phosphorus, total suspended solids, and *E. coli.* Conductivity levels were above benchmark levels at all four sites. Additionally, Macroinvertebrate Biological Integrity (MBI) ratings are significantly lower in the headwaters of Swift Camp Creek than in the other sites in the project area.

Table 5.2: Water quality issues in Swift Camp Creek sub-watershed and possible BMPs to address them.

Water Quality Issue	Suspected Source(s)	Best Management Practice
E. coli	Failing septic systems	Education about septic issues
		Septic pumpout and/or repair and replacement program
Total Suspended Solids	Stormwater runoff	Education on stormwater pollution in the watershed
	Urbanization	Riparian buffer establishment and/or conservation easements
Nitrate-Nitrite	Failing septic systems	Education about septic issues
		Septic repair and replacement program
	Urbanization	Riparian buffer establishment and/or conservation easements
Total Phosphorus	Failing septic systems	Education about septic issues
		Septic repair and replacement program
	Urbanization	Riparian buffer establishment and/or conservation easements
Conductivity	Failing septic systems	Education about septic issues Septic repair and replacement program
	Urbanization	Riparian buffer establishment and/or conservation easements
Microinvertebrate Biological Integrity	Failing septic systems	Education about septic issues Septic repair and replacement program
	Urbanization	Riparian buffer establishment and/or conservation easements

Indian Creek

Total phosphorus and conductivity are issues for Indian Creek. This may be due to development near the headwaters including homes, businesses, and failing septic systems in the area. Both of these elevated parameters could be contributed to natural limestone geology and/or the limestone quarry located near the headwaters (see Table 5.3). Indian Creek had the lowest MBI score of 68.7/69.8 = Fair, other than Swift Camp Creek. This may be due to development activities in the headwaters area.

Table 5.3: Water quality issues in the Indian Creek sub-watershed and possible BMPs to address them.

Water Quality Issue	Suspected Source(s)	Best Management Practice
Nitrate-Nitrite	Failing septic systems	Education about septic issues
		Septic repair and replacement program
	Urbanization	Riparian buffer establishment and conservation easements
Total Phosphorus	Failing septic systems	Education about septic issues
		Septic repair and replacement program
	Urbanization	Riparian buffer establishment and conservation easements
Conductivity	Failing septic systems	Education about septic issues Septic repair and replacement program
	Urbanization	Riparian buffer establishment and conservation easements
Macroinvertebrate Bioassessment Integrity	Urbanization	Riparian buffer establishment and/or conservation easements

Gladie Creek

Gladie Creek appears to be in relatively good condition. This is evident by the "excellent" MBI score. BMPs may not be necessary in the headwaters of this stream. Although, continuing the erosion work related to dispersed recreation lower in the sub-watershed may be a good idea.

Clifty Creek

Clifty Creek had the lowest prioritization score of the four sub-watersheds studied. This means that, overall, it has the best water quality. However, there was only one site in the Clifty Creek sub-watershed, and it was only sampled for biology – no water quality parameters were collected at this site.