5.0 ASSESSMENT OF WATER QUALITY PROBLEMS

The focus of this watershed assessment is to assess existing conditions in the Ballenger Creek watershed, identify water quality problems, and describe opportunities to improve water quality. The assessment of current conditions presented in Section 4 indicates a wide range of potential stressors, including both urban and agricultural land use activities. In addition, projections of future development and estimates of future impervious surface highlight the need to consider potential future impacts.

Within the last 10-15 years, development around the City of Frederick has expanded southward, replacing rural, agricultural, and undeveloped lands in the north-central and eastern portions of Ballenger Creek watershed. Projections of future development predict that urban land use, currently at approximately 25 percent, will expand rapidly to about 62 percent over the next 20 years. Impervious surface in the watershed is currently at a level where stream impacts are typically observed, and an increase brought about by additional development is likely to place additional stress on Ballenger Creek's water quality, biological integrity, and physical habitat.

Common stresses associated with urbanization include the loss of natural vegetation throughout the watershed and particularly the loss of riparian vegetation, which supports many important stream processes. Riparian vegetation stabilizes streambanks and reduces the inputs of nutrients, sediment, and other pollutants. Riparian vegetation also provides shade and contributes to shoreline and stream habitat quality by supplying rootwads and other woody debris that serve as cover for amphibians, reptiles, mammals, fish, and invertebrates. Other effects of urbanization can include more variable stream flows, increased erosion from runoff, habitat degradation caused by channel instability, increased nonpoint source pollutant loading, elevated air and water temperatures, and losses of biological diversity.

A list of water quality problems in Ballenger Creek watershed was developed by integrating information gleaned from the environmental assessment, visual inspection for potential watershed stressors, and other analyses compiled for this report. The objective was to identify problems and their likely causes as a basis for identifying opportunities to improve water quality.

Problems affecting water quality in Ballenger Creek and its tributaries are predominantly those arising from both urban and agricultural nonpoint sources. General problem types evident in Ballenger Creek and its tributaries include alterations of natural flow regimes (i.e., rapid conveyance of stormwater into stream channels), sediment deposition, and physical habitat degradation. In many cases, problems are minor, particularly where the presence of extensive forest buffer or existing stormwater management facilities provide some protection from the impacts of nearby land uses. More severe impacts were apparent at particular locations, especially in the lower sections of Ballenger Creek where karstic features re-route surface runoff and streamflows underground, create instabilities in existing BMPs, and otherwise increase the complexity of SWM issues. Taken individually, many of the activities in the watershed likely have little detrimental effect; however, the cumulative effect of these activities throughout the watershed can be of greater concern.

Water quality problems within Ballenger Creek loosely fall into ten groups centered around the following issues: karst, hydrologic modification, livestock access to stream, cropland runoff, failing septic systems, new construction, future development, industrial/commercial development, existing structures, and stream restoration.

5.1 Ranking of Water Quality Problems

In order to prioritize the water quality problems, specific criteria were developed to assess and rank problems identified. For each problem, scores of 1 to 5 were assigned for the following factors:

- Extent: the spatial extent of the problem, ranging from local (1) to widespread (5)

- Severity: the degree to which the problem is a detriment to stream quality, ranging from mild (1) to most severe (5)

- Potential for environmental restoration benefit: this factor answers the questions "Would action likely bring about improvement in the condition of the environmental resource?" and "Overall, would restoration action likely be successful and cost-effective at this site?" Answers were scaled from little potential restoration benefit (1) to great potential benefit (5).

An average of the extent, severity, and restoration potential scores was then calculated to produce an overall water quality problem rating (1-5). Problems with an overall rating score of 3.0 or higher were then selected as priority issues because they present the greatest opportunity for improving water quality.

A summary of specific problems under each of the general types, along with rankings, is given in Table 5-1.

5.2 Opportunities to Improve Water Quality

In the last several years, Frederick County has expended considerable resources and effort to expand its NPDES stormwater management programs. These efforts have resulted in strong facility inspection, GIS and database management, permit review, stormwater sampling, and watershed assessment components. The County is also currently updating its stormwater management ordinance to reflect recent changes in State requirements.

In order to increase the effectiveness of the County's SWM management programs, an adaptive management process is being followed, with refinements continuously considered and implemented. As such, a number of additional opportunities are recommended that would enable the County to better address SWM issues and improve water quality (Table 5-1). These opportunities include site-specific activities as well as general programmatic refinements that could apply to many areas and thus address cumulative effects throughout the Ballenger Creek watershed.

Many of the programmatic approaches recommended in the watershed assessment for Lower Bush Creek watershed (Roth et al. 1999a) are applicable to the problems noted here. As funding and staff resources allow, implementation of these approaches, especially those pertaining to education/outreach and agricultural issues, will bring about County-wide improvements and therefore help conditions in Ballenger Creek.

Several opportunities recommend Division of Public Work (DPW) coordination with other agencies. Managing stormwater at the county level is a complex task and involves a number of County agencies. While stormwater management is not the primary mission of these agencies, it is an issue that land use planners, road managers, development review staff, and conservation district staff deal with frequently. Staff from multiple agencies are often dealing with similar problems or working on related tasks, however, coordination is often informal at best. Organization of a more formal coordination committee between County agencies could help avoid duplication of efforts, share resources and knowledge, and provide more effective and consistent management of stormwater. Also, working with MDE and the City of Frederick is recommended, to address issues that fall outside the County's jurisdication.

The north-central and eastern portions of Ballenger Creek watershed contain relatively intense development. Much of the newer residential and commercial development appears to conform to current stormwater management standards; however, the presence of karst in the Frederick Valley presents special circumstances that may not be adequately addressed by existing facilities. As the collective knowledge base for stormwater management advances, new techniques may be available for addressing management issues in karst areas that were not available at the time many of these facilities were constructed. Therefore, retrofit opportunities may be available in the future.

Even with strict adherence to current stormwater control practices and implementation of BMPs for erosion and sediment control, it will be difficult to prevent any diminishment of the current level of stream water quality and habitat integrity in the watershed, especially given the projected level of development within the watershed. For example, most construction sites within Frederick County meet current erosion and sediment control requirements, however not all sediment is contained given the limits of existing technology. Therefore, the County may want to find ways to improve the efficiency of site controls in order to better retain topsoil and protect water resources. Given that no SWM practices are 100 percent effective in reducing runoff, sediment, and erosion, some degree of stream degradation is also likely to occur, as indicated by the amount of impervious surfaces within the watershed. However, without such stormwater control measures, far greater degradation would likely result.

Table 5-1. Assessment of water quality problems in Ballenger Creek watershed. Shading indicates problems with the greatest opportunity for improving water quality.

Problem ID	Location	Stream Affected	Description of Problem	Extent of Problem	Severity of Problem	Potential for Environmental Restoration Benefit	Overall Rating	Opportunities to Improve Stream Water Quality
Karst								
KA1	Portions of eastern third of watershed underlain by Frederick Limestone formation	Mainstem Ballenger Creek and tributaries in eastern third of watershed	Sinkholes, disappearing streams, and unlined SWM facilities can introduce stormwater and other pollution sources to groundwater	5	4	4	4.3	Develop karst ordinance with overlay zones, implement demonstration projects (structural and/or non-structural BMPs) to protect groundwater and improve stormwater management in karst areas
Hydrologic modifications								
HM1	Various locations watershed-wide	Entire watershed	Sediment discharged directly into stream channel at road crossings	5	4	3	4.0	Continue coordination with Highway Dept. to develop a road maintenance program to collect cinders, use less salt (as in the County's current initiative), create turnouts into vegetated filter strips, and use street sweepers and clean out storm drains in more urban areas
HM2	Channelization, W. of intersection of Renn and Elmer Derr Roads.	Unnamed tributary to Renn Branch	Straightened stream channel with possible headcutting and downstream sediment deposition	1	3	4	2.7	Monitor stream conditions to determine if channelization has caused detrimental effects
HM3	Culverts beneath Corporate Drive at Pike Branch	Pike Branch	Heavy coating of sediment and standing water in outlet aprons	1	2	5	2.7	Possible opportunity for SWM retrofit involving a sediment trap or vegetated filter
HM4	Concrete lined channels, particularly in areas of older development	North-central region of the watershed	Artificial substrate increases flashiness of flow	2	3	1	2.0	Suggest that property owners/home owners associations retrofit the lined channels during the next major maintenance effort
Livestock access to stream								
LA1	Western half of watershed	Mainstem Ballenger Creek, Renn Branch, Butterfly Branch, and several headwater tributaries to mainstem	Unrestricted livestock access to stream	3	4	5	4.0	NRCS or SCD conservation specialists can help farmers limit livestock access to streams with streambank fencing, and develop alternate watering and stream crossing facilities. Develop process for improved coordination with NRCS and SCD whereby DPW would notify them of problem sites or other concerns, as necessary, and follow up to confirm how problems have been addressed

Table 5-1. (Continued)

Problem ID	Location	Stream Affected	Description of Problem	Extent of Problem	Severity of Problem	Potential for Environmental Restoration Benefit	Overall Rating	Opportunities to Improve Stream Water Quality
Cropland runoff								
CR1	Western half of watershed	Mainstem Ballenger Creek, Renn Branch, Butterfly Branch, and several headwater tributaries to mainstem	General agricultural impacts arising from agriculture - sediment, excess fertilizers, narrow/absent riparian buffers	3	3	4	3.3	NRCS or SCD conservation specialists can help farmers implement current agricultural BMPs to manage nutrients, prevent soil erosion, trap sediment, and plant riparian buffers. Develop process for coordination and report specific problems to NRCS or SCD (see LA1 above)
Failing septic systems								
FS1	Watershed-wide in older development	Entire watershed	Older houses may have failing septic systems that could affect water quality	2	2	1	1.7	Determine extent of problem. Develop educational materials for residential property owners and provide technical assistance for upgrades and maintenance. Additional efforts could include monitoring for fecal coliform, and conducting dye studies of suspect systems
New construction								
NC1	MARC Frederick Extension, MD 355	Unnamed Tributary to Monocacy River, Monocacy River, & Ballenger Creek Watershed	Large expanses of bare earth near Monocacy Station site, altered site hydrology, few erosion and sediment (E&S) controls observed	3	4	5	4.0	Falls under MDE jurisdiction; no opportunities for DPW have been identified
NC2	Various locations watershed-wide	Entire watershed	Inadequate coordination on E&S problems	3	3	4	3.3	Although E&S falls outside of DPW jurisdiction, DPW inspectors do, on occasion note E&S problems. Develop process for coordination and report specific problems to SCD (see LA1 above)
NC3	Along I-70 corridor	Tributaries in northern part of watershed	Example: New development evident in headwaters of Butterfly Branch. Although located within jurisdiction of City of Frederick, activities may affect water quality downstream	2	2	1	1.7	Coordinate management efforts in this area with City of Frederick

Table 5-1. (Continued)

Problem ID	Location	Stream Affected	Description of Problem	Extent of Problem	Severity of Problem	Potential for Environmental Restoration Benefit	Overall Rating	Opportunities to Improve Stream Water Quality
Future development								
FD1	Watershed-wide	Entire watershed	Regional growth associated with City of Frederick and MARC commuter line will increase population and development within the watershed	5	4	3	4.0	Continue to enforce planning and construction requirements for SWM controls, with the goal of not altering flows or pollutant loads from predevelopment conditions. Minimize short-term construction impacts. Identify locations for new structural BMPs in western half of watershed as new developments are proposed
Industrial/Commercial development								
IC1	Automobile scrapyard and truck repair facility, Reichs Ford Road	Unnamed Tributary to Monocacy River	Inadequate stormwater controls in area of older Industrial/Commercial development	2	3	4	3.0	Review area in greater detail to identify retrofit opportunities or work with facility owners (private landowner and City of Frederick) to improve housekeeping practices
IC2	Quarrying operations and related facilities, MD 355 & Reichs Ford Road	Quarry Branch, Unnamed tributary to Monocacy River	Dust, discharge of pumped groundwater, disruption of hydrologic regimes of receiving waters	3	4	1	2.7	MDE has been notified of dust issues. Other activities are regulated under mining discharge permit. Little opportunity for further action.
IC3	Frederick Municipal Airport	Monocacy River	Materials may wash from airport into the watershed, depending on site grading and storm drain system	1	2	3	2.0	Contact facility manager to determine if airport drains into the watershed, discuss typical stormwater pollutants from airports, and determine if housekeeping practices are adequate. Coordinate with City of Frederick, which has jurisdiction over the airport

Table 5-1. (Continued)

Problem ID	Location	Stream Affected	Description of Problem	Extent of Problem	Severity of Problem	Potential for Environmental Restoration Benefit	Overall Rating	Opportunities to Improve Stream Water Quality
Existing structures								
ES1	Riverview Plaza; MD 355	Monocacy River	Poorly vegetated banks, trash, turbid water, sediment deposition, adjacent construction of MARC station and tracks may disrupt functioning of dry pond	2	3	5	3.3	Contact MDE and request that they increase inspection and enforcement measures at the MARC construction project because it is impacting an adjacent structure under DPW jurisdiction. DPW to inspect adjacent structure and if necessary notify with facility manager to improve maintenance efforts. Take opportunity to educate facility manager about the need and importance of the BMP and its continued upkeep
ES2	Wedgewood Regional SWM Facility, Wedgewood Boulevard	Unnamed tributary entering Ballenger Creek just upstream of MD 85	Accumulated sediment in forebay, trash and debris below outlet, blown out swale entering basin	2	3	5	3.3	Prior to conversion of this sediment basin to SWM pond, and while bond is still being held by the County, inspect structure and if necessary, notify facility manager to improve maintenance efforts. Take opportunity to educate facility manager about the need and importance of the BMP and its continued upkeep
ES3	Frederick Industrial Regional Facility, Industrial Drive	Arundel Branch	Erosional scars and animal burrows noted in berm, damaged inlet structures	2	2	5	3.0	Inspect structure and if necessary notify facility manager to improve maintenance efforts. Take opportunity to educate facility manager about the need and importance of the BMP and its continued upkeep

Table 5-1. (Continued)

Problem ID	Location	Stream Affected	Description of Problem	Extent of Problem	Severity of Problem	Potential for Environmental Restoration Benefit	Overall Rating	Opportunities to Improve Stream Water Quality
Stream Restoration								
SR1	Ballenger Creek behind Ballenger Creek Elementary School	Ballenger Creek	Severely eroded and undercut banks, and large debris blockages immediately downstream from active livestock pasture. Several sewer line crossings have been hardened with concrete	3	5	5	4.3	Restore impacted stream channel, correct and minimize further erosion-related problems, and coordinate environmental educational opportunities with Board of Education. This site is located on publicly owned land which would significantly reduce project costs and complexity; requires coordination with Board of Education
SR2	Confluence of King and Arundel Branches with Ballenger Creek, immediately upstream of New Design Road	Mainstem Ballenger Creek, King Branch, Arundel Branch	Severe bank erosion, lateral channel migration, and grade adjustment due to destabilized channel, downstream disturbances from excess sediment	2	5	5	4.0	Correct major stream channel erosion impacts, design to reduce additional high flow degradation
SR3	Ballenger Creek at Ballenger Creek Park	Ballenger Creek	Severe bank erosion, lateral channel migration, and grade adjustment. Downstream sediment deposition	3	4	5	4.0	Restore impacted stream channel, including erosional problems. Implement joint agency effort to improve a public use area, coordinate with the Ballenger Creek Trail Project, conduct environmental education, and improve stream water quality and aesthetics
SR4	Ballenger Creek Park to the mouth of Ballenger Creek	Ballenger Creek	Limited or absent forested riparian buffer along the mainstem	2	3	5	3.3	Collaborate with Ballenger Creek trail effort and the state-wide Stream Releaf program to restore or enhance the forested riparian buffer
SR5	Various locations watershed-wide	Entire watershed	Loss of forested land	3	2	4	3.0	When off-site mitigation is being considered under Frederick County's Forest Resource Ordinance, plantings may be targeted in riparian areas to restore forested stream buffers