



# **WATERSHED ASSESSMENT OF LOWER LINGANORE CREEK FREDERICK COUNTY, MARYLAND**

**Prepared for**

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## **EXECUTIVE SUMMARY**

Lower Linganore Creek was selected as the third watershed to be assessed under Frederick County's National Pollution Discharge Elimination System (NPDES) municipal stormwater permit (Permit Number MD0068357) because of extensive development around Lake Linganore and the presence of surface water intakes for water supplies serving the County, the City of Frederick, and a country club. The focus of this watershed assessment was to assess conditions in the watershed, identify water quality problems, describe opportunities to improve water quality, and develop a water quality plan. Methods utilized in the County's previous two watershed assessments were employed in this study, with some minor modifications to the stream survey to improve consistency and compatibility with other county and state monitoring programs. In addition, the scope of this study was expanded to include computer modeling to assess watershed and subwatershed runoff and pollutant loading characteristics.

### **Watershed Characteristics**

Linganore Creek, classified as Class IV Recreational Trout Waters, drains approximately 88 square miles of agricultural, forested, and residential land located east-northeast of the City of Frederick. This study focused upon the lower half of the watershed, designated as Frederick County Watershed M-5.4, which is approximately 24,350 acres (38 square miles) in size. To facilitate analysis, Lower Linganore Creek watershed was divided into 10 subwatersheds of approximately equal size.

The watershed is located almost entirely within the Piedmont Upland portion of the Division, which is characterized by heavily rolling upland with numerous low knobs and ridges and shallow, narrow streambeds. Field observations indicate that land cover, wetlands, and wildlife conditions within the watershed are similar to those found elsewhere in the County.

Ten stream monitoring stations were established on the mainstem and tributaries of Lower Linganore Creek. Field activities involved testing water quality, quantifying physical conditions through geomorphic surveys, completing qualitative habitat assessments, sampling benthic macroinvertebrates, and conducting electrofishing surveys. Spring, summer, and fall 2001 surveys indicated that the stream supports a variety of fish and macroinvertebrate biota, including several sportfish species. Analysis of habitat condition, benthic Index of Biotic Integrity (IBI), and fish IBI scores showed that most ratings fell within the second highest category (i.e., fair). Half of the stations received fish IBI scores of poor and very poor, which is indicative of high numbers of tolerant fish species. To some degree, these conditions are typical for streams in this region, and reflect the area's long agricultural history as well as more recent urban development.

Statewide land use data from 1997 indicate that the watershed is dominated by agriculture (51%) and forest (29%), predominantly in the northern and western portions of the study area. Low-density residential (11%) and medium density residential (5%) are the next most prevalent uses, and are concentrated around Lake Linganore. Future projections of land use, based on a complete buildout scenario under current zoning plans and assuming no down-zoning, predict that low-density residential will increase to 17% and medium-density residential will increase to 18%.

Current and future population statistics indicate that an estimated 16,050 people resided in the watershed in 2000, up 25 percent from 1995. Population is expected to steadily increase over the next 20 years, reaching 26,222 in 2020, more than double the 1995 level. In 1995, there were 4,841 households in Lower Linganore Creek watershed. By 2020, the projected number of households is 9,922, again more than doubling the 1995 value.

Analysis of existing infrastructure shows that the Spring Ridge and Lake Linganore communities in the central portion of the watershed are currently served by public water and sewer, and that in the near future, service will be extended into the south-central portions of the watershed. Approximately two-thirds of the watershed is currently served by residential wells and septic systems.

An inventory of potential pollution sources revealed that 33 stormwater management facilities are located within the watershed. A review of MDE and USEPA databases indicate no significant threats from known discharges to water, hazardous waste sites, or releases likely to adversely affect watershed conditions. A large portion of the development in the Lake Linganore area lacks modern stormwater management controls. Narrow riparian buffers around the lakes and along the streams were a widespread problem, as were livestock impacts to streams in rural areas. The amount of impervious surface area within Lower Linganore Creek watershed, estimated at 7 percent, is less than the 10 percent imperviousness threshold at which adverse effects are often reported.

## **SWMM Modeling**

The Stormwater Management Model (SWMM) was used to assess runoff and pollutant loading characteristics of the watershed and its 10 subwatersheds. Results for the current scenario indicated that the highest urban pollutant loadings are in the Mainstem Linganore Creek and Long Branch subwatersheds, while Chestnut Grove and Detrick subwatersheds had the highest agricultural loadings. The future scenario predicted that the Mainstem Linganore Creek, Long Branch, and Hazelnut Run subwatersheds would have the highest urban pollutant loadings, while Chestnut Grove and New London subwatersheds would have the highest agricultural pollutant loadings.

## **Assessment and Ranking of Water Quality Problems**

Problems affecting water quality in Lower Linganore Creek and its tributaries are predominantly those arising from both urban and agricultural nonpoint sources. General problems evident in the watershed include alteration of natural flow regimes (i.e., rapid conveyance of stormwater into stream channels), sediment deposition, and physical habitat degradation. In many cases, problems have resulted in minor or moderate impacts, particularly where vegetated or forested buffer or existing stormwater management facilities have provided some protection from the impacts of nearby land uses. 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 impacts within Lower Linganore Creek loosely fall into ten groups centered around the following issues: cumulative impacts, hydrologic modification, livestock access to stream, cropland runoff, failing septic systems, new construction, future development, industrial/commercial development, existing structures, and inadequate SWM controls. Site-specific and/or general programmatic opportunities were identified for each problem that would help improve water quality within the watershed. Sites were sorted by overall rating for the entire watershed, and by subwatershed, to help prioritize problems and focus future improvement efforts.

## **Watershed Water Quality Plan**

The most promising opportunities to address water quality problems in the Lower Linganore Creek watershed were selected as components of a watershed water quality plan. Further implementation will depend upon cost, available funding, feasibility, and the likelihood of success in improving or sustaining stream habitat and water quality. Recommendations include general programmatic approaches that can be expected to provide benefit to large areas or even County-wide, as well as more site-specific opportunities to implement best management practices (BMPs) at particular locations. Additional recommendations include stream corridor restoration at two locations along Bens Branch, and the further investigation of an automotive scrapyards, which may release contaminants to soil, groundwater, or surface water resources. Actions will address the primary threats to water quality, including stormwater runoff from existing development, livestock access to streams, agricultural runoff, and future construction and development.

Table ES-1 summarizes actions recommended in the watershed water quality plan and presents the proposed implementation schedule. A preliminary cost estimate was also developed for each recommendation.

The final part of the water quality plan includes periodically monitoring conditions within the watershed to evaluate the effectiveness of water quality improvements as a result of project

implementation. It is recommended that conditions at the ten Lower Linganore Creek watershed monitoring stations be reevaluated approximately every three years using the biological and physical assessment methods described in Section 2.3.1. In addition to stream monitoring data, it is recommended that supplemental visual inspections and photographic documentation of specific site locations be conducted periodically to monitor effectiveness of management actions. Because natural variability may make it difficult to detect trends in stream monitoring data until a long-term data set is amassed, visual inspection results will help demonstrate whether management actions are beginning to achieve the desired benefit, or whether additional corrective measures are needed.

Event	Plan Approval	Year 1		Year 2		Year 3		Year 4		Year 5		Year 6	
		1 <sup>st</sup> Half	2 <sup>nd</sup> Half	1 <sup>st</sup> Half	2 <sup>nd</sup> Half	1 <sup>st</sup> Half	2 <sup>nd</sup> Half	1 <sup>st</sup> Half	2 <sup>nd</sup> Half	1 <sup>st</sup> Half	2 <sup>nd</sup> Half	1 <sup>st</sup> Half	2 <sup>nd</sup> Half
<b>Strategic Opportunities</b>													
Source water protection plan for Linganore Creek		on-going											
Continued Interagency Coordination		on-going											
Monitor Agricultural Preservation Districts													
Assessment and site maintenance agreements													
Retrofit and restoration feasibility analysis													
<i>Select watersheds and subwatersheds</i>													
<i>Conduct feasibility analysis in first subwatershed</i>													
<b>Management Practices</b>													
Facilitate local SWM control efforts in older developments near lake			on-going										
Reduce livestock access to streams		on-going											
Maintenance issues													
Opportunities to improve water quality on County-owned properties													
<i>Inquiries to ES3 (Linganore High School)</i>													
<i>Retrofit to ES3 (Linganore High School)</i>													
<i>ES2 (County public safety training facility) project</i>		on-going											
Unpaved construction roads		on-going											
<b>Stream Corridor Restoration</b>													
Watershed Branch across from Millime Court													
<i>Feasibility evaluation</i>													
<i>Design</i>								†					
<i>Construction</i>										‡			
Watershed Branch at Gas House Pike													
<i>Feasibility evaluation</i>													
<i>Design</i>								†					
<i>Construction</i>										‡			
<b>Other Investigations at Specific Sites</b>													
CD1) Countryside Auto Parts													

Table ES-1. Timetable for the recommended approval

beginning after plan

- †: Schedule begins with approval of feasibility evaluation
- ‡: Schedule begins with approval of designs



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