Total Maximum Daily Load

Evaluation

for

Cedar Creek

in the

Oconee River Basin

(Lead)

Submitted to:

The U.S. Environmental Protection Agency
Region 4
Atlanta, Georgia

Submitted by:
The Georgia Department of Natural Resources
Environmental Protection Division
Atlanta, Georgia

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1.0 INTRODUCTION

1.1 Background

The Environmental Protection Division of the Georgia Department of Natural Resources (Georgia EPD) assesses its water bodies for compliance with water quality standards criteria established for their designated uses as required by the Federal Clean Water Act (CWA). Assessed water bodies are placed into three categories; supporting, partially supporting, or not supporting their designated uses depending on water quality assessment results. These water bodies are found on Georgia's 305(b) list as required by that section of the CWA that defines the assessment process, and are published in *Water Quality in Georgia* every two years.

Some of the 305(b) partially and not supporting water bodies are also assigned to Georgia's 303(d) list, which is also named after that section of the CWA. Water bodies on the 303(d) list are required to have a Total Maximum Daily Load (TMDL) established for the water quality constituent(s) in violation of the water quality standard. The TMDL process establishes the allowable loading of pollutants or other quantifiable parameters for a water body based on the relationship between pollution sources and in-stream water quality conditions. This allows water quality based controls to be developed to reduce pollution and restore and maintain water quality.

The State of Georgia has identified 4 miles of Cedar Creek, from the Winder Reservoir to its confluence with the Mulberry River, in the Oconee River basin as partially supporting its designated uses for the parameter lead. The water use classification of Cedar Creek is Fishing.

1.2 Watershed Description

The Cedar Creek watershed is located in the Oconee River basin in northeastern Georgia in Barrow County (see Figure 1). The watershed is part of the Southern Lower Piedmont Ecoregion. It is in the Southern Piedmont Soil Province. Cedar Creek is used as a water supply for the City of Winder upstream of the listed segment. After it runs through the Winder Reservoir it continues in a northeastern direction until its confluence with the Mulberry River at the Barrow County and Jackson County line downstream of Winder.

There are no point source discharges in the Cedar Creek watershed. The stream flows through areas that are predominantly residential. The stream also flows through land that is used by the City of Winder as a Land Application System (LAS). The treated wastewater application is regulated by the Georgia EPD under Permit No. GA02-014. There are buffer zones and operation plans for the system. It would not be expected to contribute detectable levels of lead contamination. Any nonpoint runoff from these activities, as well as urban and other nonpoint loads will be covered under the Load Allocation part of this TMDL.
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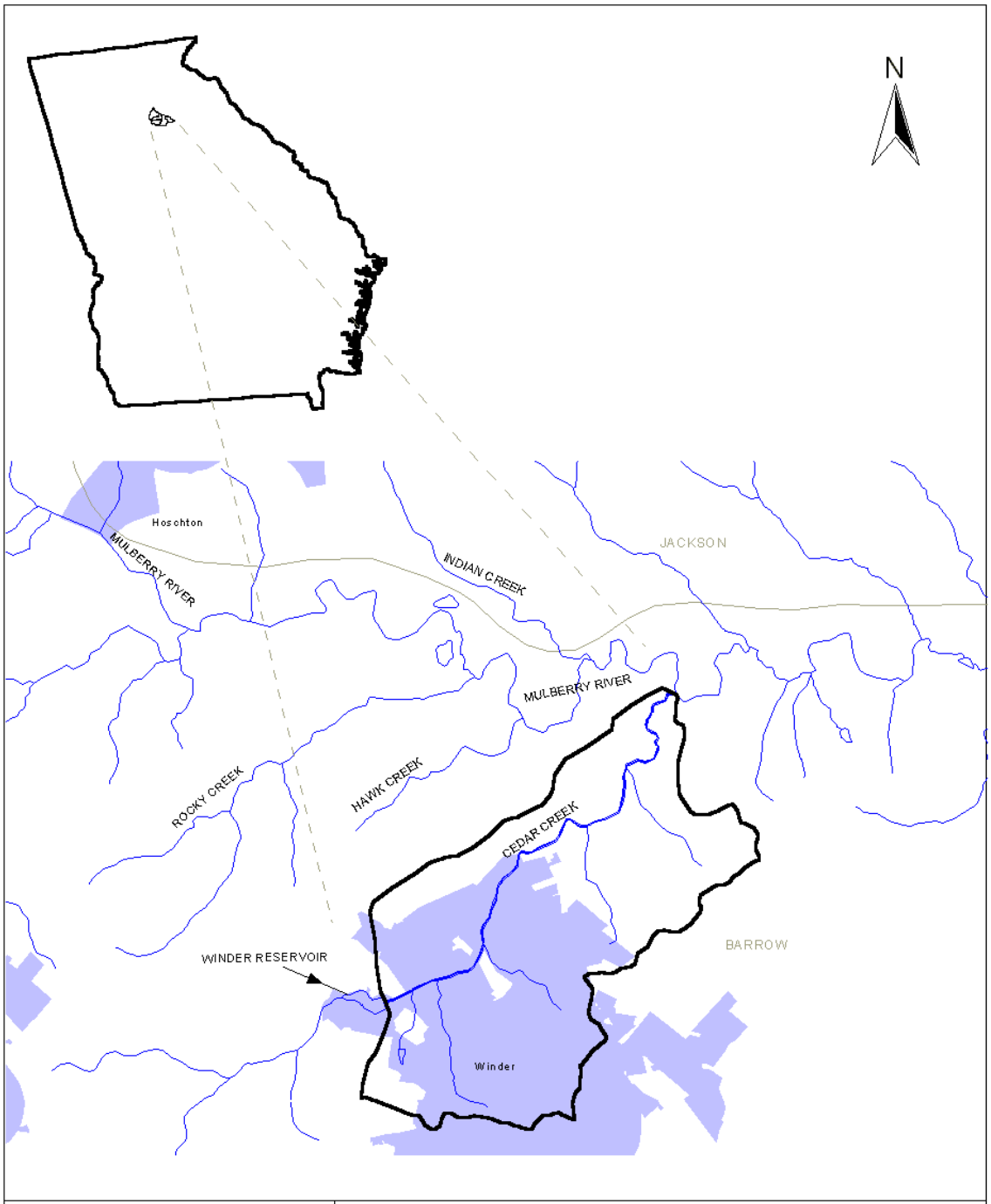
The 1-day, 10-year minimum (1Q10) statistical flow value at the confluence of Cedar Creek and the Mulberry River is estimated to be 0.25 cubic feet per second (cfs). The 7-day, 10-year minimum (7Q10) statistical flow value associated is estimated to be 0.28 cfs. The fact that the Creek flows through a reservoir makes it necessary to estimate these flows.



TMDL Evaluation - Lead **Oconee River Basin**	**Figure 1. Cedar Creek Watershed**

1.3 Water Quality Standard

The water use classification for Cedar Creek is Fishing. The Fishing classification, as stated in Georgia's Rules and Regulations for Water Quality Control Chapter 391-3-6-.03(6)(c), is established to protect the "Propagation of Fish, Shellfish, Game and Other Aquatic Life; secondary contact recreation in and on the water; or for any other use requiring water of a lower quality."

Chapter 391-3-6-.03(5)(e)(ii) of Georgia's Rules and Regulations establishes criteria for metals that apply to all waters in the State. The established chronic criterion and acute criterion for dissolved lead are as follows:

acute criteria for dissolved lead:

$$(e^{(1.273[\ln(\text{hardness})] - 1.460)})(1.46203-[(\ln \text{hardness})(0.145712)]) \text{ µg/L}$$

chronic criteria for dissolved lead:

$$(e^{(1.273[\ln(\text{hardness})] - 4.705)})(1.46203-[(\ln \text{hardness})(0.145712)]) \text{ µg/L}$$

The hardness used in the above equations is expressed as mg/L as $CaCO_3$. The minimum hardness allowed for use in these equations shall not be less than 25 mg/L as $CaCO_3$, and the maximum shall not be greater than 400 mg/L as $CaCO_3$.

This regulation requires that instream concentrations of dissolved lead shall not exceed the acute criteria indicated above, under 1Q10 or higher stream flow conditions and shall not exceed the chronic criteria indicated above, under 7Q10 or higher stream flow conditions.

In accordance with Georgia Rules and Regulations for Water Quality Control 391-3-6-.03(5)(e)(ii), guidance found in EPA's "Guidance Document of Dynamic Modeling and Translators August 1993" may be used to determine the relationship between the total recoverable concentration of a metal and the dissolved form of a metal. The metals translator is determined using default linear partition coefficient values found in an EPA document entitled, "Technical Guidance Manual for Performing Waste Load Allocations – Book II: Streams and Rivers."

In addition, Georgia Regulation 391-3-6-.06(4)(d)5.(ii)(b)(2) allows methods from this EPA guidance document to be used to translate dissolved criteria concentrations into total recoverable permit limits. Metals effluent permit limitations are required to be expressed as total recoverable metal per 40 CFR §122.45(c). Therefore, the TMDL will be expressed as both the total maximum daily load of total recoverable lead that will be protective of the dissolved lead chronic criterion and the total maximum daily load of total recoverable lead that will be protective of the dissolved lead acute criterion.

2.0 WATER QUALITY ASSESSMENT

The listing of Cedar Creek for lead resulted from the assessment of water quality data from Cedar Creek measured in 1994. This segment of Cedar Creek was first listed for lead in the Georgia 1994 303(d) list. It was listed based on limited data. The validity of the historical data is suspect due to the potential for contamination during sampling. The recent data collected in March 2001 was collected using clean sampling techniques. The samples were collected at Miles Patrick Road and at Rockwell Church Road. These locations are downstream from the Winder Reservoir, which makes them representative of the segment. Lead was not detected in these samples. A second set of samples, representing summer conditions, was collected in June 2001. When available, the results from these samples will help determine whether this segment is supporting its designated use. The data is provided in Table 1.

Table 1. Lead Data Collected From Cedar Creek

Date	Location	Measured total recoverable lead concentration (μg/L)	Assumed dissolved lead concentration (μg/L)	Measured Total Hardness (μg/L as $CaCO_3$)	Acute criterion (μg/L)	Chronic Criterion (μg/L)
10/27/94	Miles Patrick Road	12	12	* 25	14	0.54
10/27/94	Highway 53	6.8	6.8	*25	14	0.54
3/1/01	Miles Patrick Road	not detected	not detected	26	14.5	0.6
3/1/01	Rockwell Church Road	not detected	not detected	30	17	0.7

* Hardness was not measured at that time. Assume the lowest value (25), which can be used in these calculations. This value is consistent with recent data

3.0 SOURCE ASSESSMENT

A source assessment characterizes the known and suspected sources of lead in the watershed for use in a water quality model and the development of the TMDL. The general sources of lead are point and nonpoint sources. Nonpoint sources of lead are diffuse sources that cannot be identified as entering the water body at a single location.

There are no point source dischargers in the watershed contributing to the listed segment of Cedar Creek. It is unknown whether any nonpoint sources potentially cause or contribute to excursions of the water quality standard for lead. There are no data available that indicate any specific nonpoint source of lead. Lead is used in piping, building materials, solders, paint, ammunition, castings, storage batteries, metal products and pigments (Moore and Ramamoorthy, 1983). However, the nature of these potential sources is not well understood or documented at this time. The EPD will address nonpoint source urban runoff through a watershed protection strategy.

4.0 TMDL DEVELOPMENT APPROACH

An important component of TMDL development is to establish relationships between source loadings and in-stream water quality. In this section, the numerical modeling techniques used to develop the TMDL are discussed.

4.1 Steady-State Approach

Steady-state models are applied for "critical" environmental conditions that represent extremely low assimilative capacity. For riverine systems where there are no known sources of nonpoint source pollution, critical environmental conditions correspond to drought flows. The assumption behind steady-state modeling is that effluent concentrations that protect water quality during critical conditions will be protective for the large majority of environmental conditions that occur. A mass balance equation is used in section 5.3 to model the critical conditions and calculate allocations.

4.2 Critical Conditions

The lack of understanding regarding the source of the lead makes the determination of appropriate critical conditions impossible. Until there is a better understanding of the source of lead, it is assumed that critical conditions occur during low flows. Therefore, the critical flow conditions are defined as shown in Table 2.

Table 2. Critical Flow Conditions for Cedar Creek

Source of Flow	Flow value (MGD/ cfs)
Cedar Creek (during 7Q10 conditions)	0.18/0.28
Cedar Creek (during 1Q10 conditions)	0.16/0.25

The hardness of the receiving waters is also a critical condition in calculating the dissolved fraction of lead in the Creek. A lower hardness results in a higher proportion being in the dissolved form resulting in more conservative criterion. Based on the available hardness data measured in Cedar Creek, the hardness value used is 25 mg/L (i.e., the lowest hardness value that can be used for water quality criterion calculations). This hardness value corresponds to a dissolved lead chronic criterion of 0.54 μg/L and a dissolved lead acute criterion of 14μg/L.

5.0 ALLOCATION

5.1 Total Maximum Daily Load

A TMDL is the sum of the individual WLAs for point sources and load allocations (LA) for nonpoint sources and natural background (40 CFR 130.2). The sum of these components may not result in an exceedence of water quality standards for that water body. To protect against exceedences, the TMDL must also include a margin of safety (MOS), either implicitly or explicitly, that accounts for the uncertainty in the relationship between pollutant loads and the water quality response of the receiving water body. Conceptually, a TMDL can be expressed as follows:

$$TMDL = \Sigma WLAs + \Sigma LAs + MOS$$

The TMDL is the total amount of pollutant that can be assimilated by the receiving water body while maintaining water quality standards. For pollutants such as metals, TMDLs are expressed on a mass-loading basis (e.g., pounds per day). In accordance with 40 CFR Part 130.2(i), "TMDLs can be expressed in terms of ... mass per time, toxicity, or other appropriate measure."

5.2 Waste Load Allocations

Based on the absence of any point source dischargers to this watershed, the wasteload allocation is equal to 0.0 kg/day.

5.3 Load Allocations

There are no known nonpoint sources of lead that contribute to the impairment of Cedar Creek. The load allocation represents the allowable dissolved lead loading during 1Q10 and 7Q10 flow conditions. This loading is calculated using the dissolved lead criteria as follows:

<u>To protect against the chronic effects of dissolved lead:</u>

allowable loading = dissolved chronic criterion x 7Q10 flow x units conversion factor

= 0.54 μg/L x 1.8×10^5 gallons/day x 3.785L/gallon x (10^{-9}kg/μg)

= 3.7×10^{-4} kg/day

<u>To protect against the acute effects of dissolved lead:</u>

allowable loading = dissolved acute criterion x 1Q10 flow x units conversion factor

= 14 μg/L x 1.6×10^5 gallons/day x 3.785 L/gallon x (10^{-9}kg/μg)
= 8.5×10^{-3} kg/day

5.4 TMDL Results

This TMDL can be summarized as follows:

Table 3. TMDL Summary For Cedar Creek

Parameter	Criterion	WLA	LA	MOS	TMDL
Dissolved Lead	Chronic	0.0 kg/day	3.7×10^{-4} kg/day	Implicit	3.7×10^{-4} kg/day
Dissolved Lead	Acute	0.0 kg/day	8.5×10^{-3} kg/day	Implicit	8.5×10^{-3} kg/day

5.5 Seasonal Variation

The low flow critical conditions incorporated in this TMDL are assumed to represent the most critical design conditions and to provide year-round protection of water quality.

5.6 Margin of Safety

The MOS is a required component of TMDL development. As specified by section 303(d) of the CWA, the margin of safety must account for any lack of knowledge concerning the relationship between effluent limitations and water quality. There are two basic methods for incorporating the MOS: 1) implicitly incorporate the MOS using conservative model assumptions to develop allocations; or 2) explicitly specify a portion of the TMDL as the MOS and use the remainder for allocations.

The MOS was implicitly incorporated into the TMDL for Cedar Creek through the use of critical low-flow conditions.

6.0 POINT AND NONPOINT SOURCE APPROACHES

Based on the absence of any point source dischargers within the watershed, there will be no allocation made through the NPDES permitting program. The load allocation cannot be attributed to a specific nonpoint source until a potential nonpoint source of lead has been identified.

7.0 PUBLIC PARTICIPATION

A thirty-day public notice was provided for this TMDL. During that time the availability of the TMDL was public noticed, a copy of the TMDL was provided as requested, and the public was invited to provide comments on the TMDL.

8.0 INITIAL TMDL IMPLEMENTATION PLAN

EPD has coordinated with EPA to prepare this Initial TMDL Implementation Plan for this TMDL. EPD has also established a plan and schedule for development of a more comprehensive implementation plan after this TMDL is established. EPD and EPA have executed a Memorandum of Understanding that documents the schedule for developing the more comprehensive plans. This Initial TMDL Implementation Plan includes a list of best management practices and provides for an initial implementation demonstration project to address one of the major sources of pollutants identified in this TMDL while State and/or local agencies work with local stakeholders to develop a revised TMDL implementation plan. It also includes a process whereby EPD and/or Regional Development Centers (RDCs) or other EPD contractors (hereinafter, "EPD Contractors") will develop expanded plans (hereinafter, "Revised TMDL Implementation Plans").

This Initial TMDL Implementation Plan, written by EPD and for which EPD and/or the EPD Contractor are responsible, contains the following elements.

1. EPA has identified a number of management strategies for the control of nonpoint sources of pollutants, representing some best management practices. The "Management Measure Selector Table shown below identifies these management strategies by source category and pollutant. Nonpoint sources are the primary cause of excessive pollutant loading in most cases. Any wasteload allocations in this TMDL will be implemented in the form of water-quality based effluent limitations in NPDES permits issued under CWA Section 402. See 40 C.F.R. § 122.44(d)(1)(vii)(B). NPDES permit discharges are a secondary source of excessive pollutant loading, where they are a factor, in most cases.

2. EPD and the EPD Contractor will select and implement one or more best management practice (BMP) demonstration projects for each River Basin. The purpose of the demonstration projects will be to evaluate by River Basin and pollutant parameter the site-specific effectiveness of one or more of the BMPs chosen. EPD intends that the BMP demonstration project be completed before the Revised TMDL Implementation Plan is issued. The BMP demonstration project will address the major category of contribution of the pollutant(s) of concern for the respective River Basin as identified in the TMDLs of the watersheds in the River Basin. The demonstration project need not be of a large scale, and may consist of one or more measures from the Table or equivalent BMP measures proposed by the EPD Contractor and approved by EPD. Other such measures may include those found in EPA's "Best Management Practices Handbook", the "NRCS National Handbook of Conservation Practices, or any similar reference, or measures that the volunteers, etc., devise that EPD approves. If for any reason the EPD Contractor does not complete the BMP demonstration project, EPD will take responsibility for doing so.

3. As part of the Initial TMDL Implementation Plan the EPD brochure entitled "Watershed Wisdom -- Georgia's TMDL Program" will be distributed by EPD to the EPD Contractor for use with appropriate stakeholders for this TMDL, and a copy of the video of that same title will be provided to the EPD

Contractor for its use in making presentations to appropriate stakeholders, on TMDL Implementation plan development.

4. If for any reason an EPD Contractor does not complete one or more elements of a Revised TMDL Implementation Plan, EPD will be responsible for getting that (those) element(s) completed, either directly or through another contractor.

5. The deadline for development of a Revised TMDL Implementation Plan, is the end of August, 2003.

6. The EPD Contractor helping to develop the Revised TMDL Implementation Plan, in coordination with EPD, will work on the following tasks involved in converting the Initial TMDL Implementation Plan to a Revised TMDL Implementation Plan:
   A. Generally characterize the watershed;
   B. Identify stakeholders;
   C. Verify the present problem to the extent feasible and appropriate, (e.g., local monitoring);
   D. Identify probable sources of pollutant(s);
   E. For the purpose of assisting in the implementation of the load allocations of this TMDL, identify potential regulatory or voluntary actions to control pollutant(s) from the relevant nonpoint sources;
   F. Determine measurable milestones of progress;
   G. Develop monitoring plan, taking into account available resources, to measure effectiveness; and
   H. Complete and submit to EPD the Revised TMDL Implementation Plan.

7. The public will be provided an opportunity to participate in the development of the Revised TMDL Implementation Plan and to comment on it before it is finalized.

8. The Revised TMDL Implementation Plan will supersede this Initial TMDL Implementation Plan when the Revised TMDL Implementation Plan is approved by EPD.

Management Measure Selector Table

Land Use	Management Measures	Fecal Coliform	Dissolved Oxygen	pH	Sediment	Temperature	*Toxicity*	*Mercury*	Metals (copper, lead, zinc, cadmium)	PCBs, toxaphene
Agriculture	1. Sediment & Erosion Control	_	_		_	_				
	2. Confined Animal Facilities	_	_							
	3. Nutrient Management	_	_							
	4. Pesticide Management		_							
	5. Livestock Grazing	_	_		_	_				
	6. Irrigation		_		_	_				
Forestry	1. Preharvest Planning				_	_				
	2. Streamside Management Areas	_	_		_	_				
	3. Road Construction &Reconstruction		_		_	_				
	4. Road Management		_		_	_				
	5. Timber Harvesting		_		_	_				
	6. Site Preparation & Forest Regeneration		_		_	_				
	7. Fire Management	_	_	_	_	_				
	8. Revegetation of Disturbed Areas	_	_	_	_	_				
	9. Forest Chemical Management		_			_				

Land Use	Management Measures	Fecal Coliform	Dissolved Oxygen	pH	Sediment	Temperature	*Toxicity*	*Mercury*	Metals (copper, lead, zinc, cadmium)	PCBs, toxaphene
	10. Wetlands Forest Management	_	_	_		_		_		
Urban	1. New Development	_	_		_	_			_	
	2. Watershed Protection & Site Development	_	_		_	_		_	_	
	3. Construction Site Erosion and Sediment Control		_		_	_				
	4. Construction Site Chemical Control		_							
	5. Existing Developments	_	_		_	_			_	
	6. Residential and Commercial Pollution Prevention	_	_							
Onsite Wastewater	1. New Onsite Wastewater Disposal Systems	_	_							
	2. Operating Existing Onsite Wastewater Disposal Systems	_	_							
Roads, Highways and Bridges	1. Siting New Roads, Highways & Bridges	_	_		_	_			_	
	2. Construction Projects for Roads, Highways and Bridges		_		_	_				
	3. Construction Site Chemical Control for Roads, Highways and Bridges		_							
	4. Operation and Maintenance-	_	_			_				

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	Roads, Highways and Bridges								_	

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