

Total Maximum Daily Loads For The Legacy Pesticides, DDT and Toxaphene, In Indian Creek and Jack Lake Creek Big Black River Basin

**Prepared by
Mississippi Department of
Environmental Quality
Office of Pollution Control**

**MDEQ
PO Box 10385
Jackson, MS 39289
(601) 961-5171
www.deq.state.ms.us**



Foreword

This report has been prepared in accordance with the schedule contained within the federal consent decree dated December 22, 1998. The report contains one or more Total Maximum Daily Loads (TMDLs) for water body segments found on Mississippi's 1996 Section 303(d) List of Impaired Waterbodies. Due to the accelerated schedule required by the consent decree, many of these TMDLs have been prepared out of sequence with the State's rotating basin approach. The implementation of the TMDLs contained herein will be prioritized within Mississippi's rotating basin approach.

The amount and quality of the data on which this report is based are limited. As additional information becomes available, the TMDLs may be updated. Such additional information may include water quality and quantity data, changes in pollutant loadings, or changes in landuse within the watershed. In some cases, additional water quality data may indicate that no impairment exists.

Table 1: Prefixes for fractions and multiples of SI Units

Fraction	Prefix	Symbol	Multiple	Prefix	Symbol
10 ⁻¹	deci	d	10	deka	da
10 ⁻²	centi	c	10 ²	hecto	h
10 ⁻³	milli	m	10 ³	kilo	k
10 ⁻⁶	micro	μ	10 ⁶	mega	M
10 ⁻⁹	nano	n	10 ⁹	giga	G
10 ⁻¹²	pico	p	10 ¹²	tera	T
10 ⁻¹⁵	femto	f	10 ¹⁵	peta	P
10 ⁻¹⁸	atto	a	10 ¹⁸	exa	E

Table 2: Conversion Factors

To convert from	To	Multiply by	To Convert from	To	Multiply by
Acres	Sq. miles	0.00156	Days	Seconds	86400
Cubic feet	Cu. Meter	0.0283	Feet	Meters	0.3048
Cubic feet	Gallons	7.48	Gallons	Cu feet	0.1337
Cubic feet	Liters	28.3	Hectares	Acres	2.471
cfs	Gal/min	448.8	Miles	Meters	1609.3
cfs	MGD	.6463	Mg/l	ppm	1
Cubic meters	Gallons	264.2	μg/l * cfs	Gm/day	2.45

TABLE OF CONTENTS

FOREWORD	2
ORIGINAL LISTING	4
PRIORITY RANKING	4
CURRENT USE PESTICIDES	4
POLLUTANT SOURCE	5
IDENTIFICATION OF WATER BODIES	5
WATER QUALITY STANDARDS AND NUMERIC TARGET	7
LOAD ALLOCATION (LA)	7
WASTELOAD ALLOCATION (WLA)	8
MARGIN OF SAFETY (MOS)	8
TMDL CALCULATION	8
SEASONAL VARIATION	8
CRITICAL CONDITION	8
PUBLIC PARTICIPATION	8
TECHNICAL ANALYSIS	9
SUPPORTING DOCUMENTATION	10
Table 1: Prefixes for fractions and multiples of SI Units	2
Table 2: Conversion Factors	2
Table 3. Water Body Locations	7
Table 4: Mississippi Fish Advisory Criteria for DDT and Toxaphene	7
Table 5: Numeric Criteria for All Waters	7
Map 1: Map of the Big Black River Basin showing the impaired waterbody segments—Indian Creek and Jack Lake Creek	6

Original Listing

Mississippi conducted a survey of district conservationists (DC) in 1988 and 1989 to find candidate watersheds for future §319 funding opportunities. MDEQ requested each DC identify the watersheds of concern in their county based on available information including land use. Numerous DCs responded to the survey and MDEQ created Mississippi's §319 list based on these surveys.

In 1992, MDEQ compiled a §303(d) list based, in part, on the §319 list of watersheds of concern. Therefore, water bodies were included on the § 303(d) list based on speculation and not water quality monitoring. MDEQ uses the term, evaluated, to describe these water bodies that were placed on the §303(d) list without monitoring data. At the time, MDEQ considered the evaluated listings from the §319 survey as a placeholder for future monitoring to determine if there were indeed impairment in the watershed.

The surveys asked for the presence of agriculture, urban areas, or forestry in the watershed. MDEQ interpreted potential pollutants present on these land uses and listed several broad potential pollutant categories based on the survey results. Every watershed, for which agriculture was checked, was then listed for sediment, pesticides, organic enrichment/low dissolved oxygen, and nutrients.

Priority Ranking

Prioritization of these TMDLs is based on compliance with the federal consent decree. The consent decree calls for all of the TMDLs for water bodies listed as evaluated on the Mississippi 1996 Section 303(d) list in the Big Black and Tombigbee River Basins be developed by MDEQ before December 2006. Water body pollutant combinations that are shown not to need a TMDL based on monitoring or good cause justification are not required to be completed by EPA or MDEQ. The water bodies in Table 3 show the listings included in the TMDL report.

Current Use Pesticides

Since the late 1980s and early 1990s, pesticide use, composition, and delivery technology have changed considerably. Current use pesticides are more biodegradable and not as persistent in the environment as the legacy pesticides DDT and Toxaphene. The improved chemical composition makes current use pesticides more expensive. Therefore, delivery technology has also been improved to reduce overspray.

This TMDL is for DDT and Toxaphene, which have been found in fish flesh samples, and it represents the pesticide listings in the 1996 and 1998 Mississippi §303(d) List. The original listings were not specific, however the listings were meant to represent pesticides for which Mississippi waters have impairment. The fish consumption advisory issued for the water bodies addressed in this TMDL report are due to elevated levels of DDT and Toxaphene. Therefore, the current use pesticides are not included in the pesticide listings. If current use pesticides were found impairing a water body segment, that segment would be listed on the next §303(d) list with the specific chemical pollutant identified.

Pollutant Source

In the 1950s and 1960s agricultural producers used pesticides that were chemically and environmentally different from the current use pesticides. DDT and Toxaphene have decades long half-lives as opposed to the days or weeks long half-lives of current use pesticides. One reason for the drastically reduced half-lives of current use pesticides is that today's competitive pesticide market is encouraging production of more "natural" and "environmentally friendly" pesticides. In essence, environmental effects of legacy pesticides are much different from those of current use pesticides and require different evaluations. Even after 25 years of little or no use, DDT metabolites are still being found in the environment.

The use of DDT was prohibited in the United States in 1973, and Toxaphene was banned in 1982. Production of both has ceased in the United States. Unfortunately, degraded metabolites of the parent compound are still present in the environment. Elevated levels have been found in several fish species, and sediment tests show that the legacy pesticides are still present in the fields and streams. The good news is that the pesticide levels found in fish are going down. The purpose of this TMDL document is to promote further reduction of the levels found in the aquatic species by promoting best management practices that keep the sediment (and the pesticides) on the fields and out of the streams.

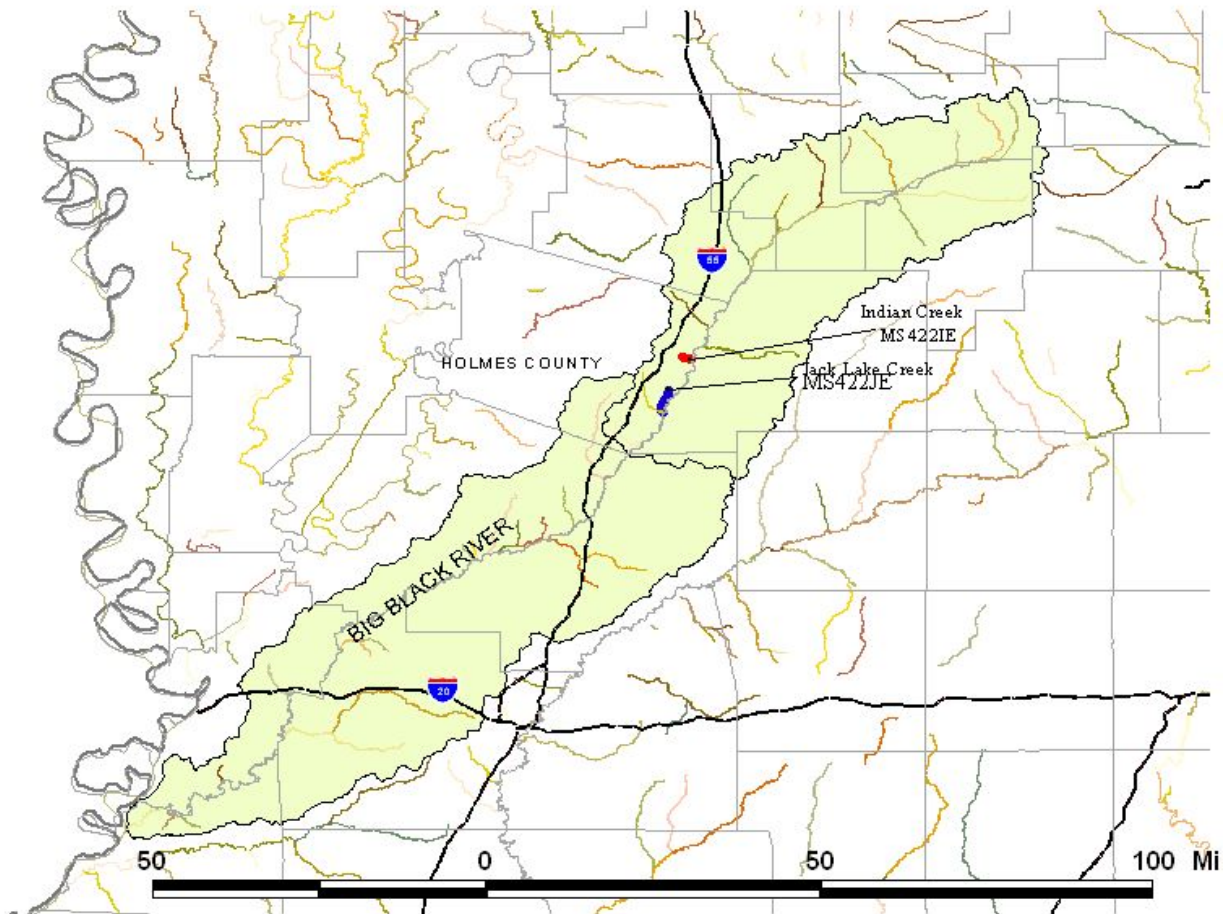
Identification of Water Bodies





This TMDL has been developed to meet the requirements of the federal consent decree between EPA Region 4 and the Mississippi Sierra Club. The consent decree is based on the 1996 §303(d) list. In that list, water bodies were listed as either monitored (M) or evaluated (E).

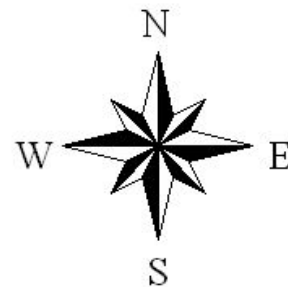
EPA agreed to complete the TMDLs for all water bodies identified as monitored during the first five-year rotation of Mississippi's basin rotation plan, and for all water bodies identified as evaluated during the second five-year rotation. This agreement was made without regard to the status of water quality data for the specific pollutant listed for the water body. There was no specific pesticide data available that would support a listing for a specific pesticide for either monitored or evaluated listings. However, there were several fish samples that indicated the need for a fish consumption advisory for DDT and Toxaphene contamination.

MDEQ is preparing this TMDL for the pesticide listings for two water bodies in the Big Black River Basin. Table 3 lists the water body name, identification number, and location information for each water body included in this TMDL Report. The report addresses two water bodies, Jack Lake Creek and Indian Creek. Indian Creek is an evaluated listing and Jack Lake Creek was monitored as impaired for biological impairment. But there are no DDT or Toxaphene data for listing this stream.

Big Black River Basin Segments Impaired by Legacy Pesticides



-  **County Borders**
-  **Primary road with limited access**
-  **State Border**
-  **Big Black River Basin**



Map 1: Map of the Big Black River Basin showing the impaired waterbody segments—Indian Creek and Jack Lake Creek

Table 3. Water Body Locations

Water Body Name	Water Body ID	Description of Location
Indian Creek	MS422IE	Near Goodman from Headwaters to Mouth at Big Black River
Jack Lake Creek	MS422JE	Near Goodman from Headwaters to Mouth at Box Creek

Water Quality Standards and Numeric Target

Typically, MDEQ selects a target for TMDL development that corresponds to the standard for the pollutant. In this case, the target for DDT and Toxaphene are based on water column concentrations shown in Table 4. The target for the DDT TMDL is the human health water and organism concentrations and the target for the Toxaphene TMDL is the fresh water chronic concentration. The Mississippi Fish Advisory Criteria for DDT and Toxaphene are presented in Table 4. While it is understood that it will take many years for these pollutants to dissipate, fish flesh monitoring does indicate a declining trend. The TMDL target is water column concentrations below the standard for the pollutants.

Table 4: Mississippi Fish Advisory Criteria for DDT and Toxaphene

Consumption	Fish Tissue Concentration (mg/kg) DDT	Fish Tissue Concentration (mg/kg) Toxaphene
No Limit	<1.0	<0.4
2 meals/month	1.0 – 5.9	0.4 – 1.9
No Consumption	>6.0	>2.0

Table 5: Numeric Criteria for All Waters

Parameter	Fresh Water Acute	Fresh Water Chronic	Human Health Organisms	Human Health Water and Organisms
4,4 DDT	1.1 µg/l	0.001 µg/l	0.00059 µg/l	0.00059 µg/l
Toxaphene	0.73 µg/l	0.0002 µg/l	0.00075 µg/l	0.00073 µg/l

To gauge the declining trend, the Mississippi Fish Advisory Task Force selected the levels shown in Table 4 for issuance of fish consumption advisories. It is important to note these levels and continued monitoring is needed to track future declining trends for these pollutants.

Load Allocation (LA)

DDT and Toxaphene are prohibited from use currently and have been since 1973 and 1983 respectively. Declining trends shown in monitoring fish flesh indicate that the environment is heading toward recovery. The intermediate goal in this TMDL is to reduce levels to such a point that current fish consumption advisories can be eliminated. The current levels indicated by fish tissue monitoring should be reduced below the action level for the consumption advisory. The TMDL target is commensurate with the human health water and organism standard for DDT of 0.59 ng/l, and the fresh water chronic standard for Toxaphene of 0.2 ng/l, shown in Table 5.

Once the fish flesh target is met and no further consumption advisories are needed, the load allocation can be determined by multiplying any flow by the concentration standard. This is shown as:

$$LA = Q * \text{standard} * \text{conversion factor}$$

These will work in conjunction as BMPs are installed to reduce the sediment load in the streams.

Wasteload Allocation (WLA)

The WLA for this TMDL is zero. There are no known permitted sources for DDT or Toxaphene in Mississippi.

Margin of Safety (MOS)

The MOS is implicit because the TMDL does not allow for loading from point sources. The complete elimination of the fish advisories based on declining levels of the pollutant found in the fish flesh is the goal of the TMDL.

TMDL Calculation

The TMDL is calculated in the following way:

$$TMDL = WLA + LA + MOS$$

where $WLA = 0$ and the MOS is implicit. Therefore, the TMDL equals the LA, which is determined by the flow multiplied by the standard and a conversion factor.

Seasonal Variation

The target of no pollutant concentration above the fish advisory consumption level is a year-round goal. Since the WLA and LA apply at all times, the TMDL provides for year-round protection of water quality standards for pesticides. Therefore, the TMDL adequately accounts for seasonal variability.

Critical Condition

The TMDL represents all flows at all times, and is based on levels of the pollutants found in monitoring fish flesh. The nature of DDT and Toxaphene causes them to have year-round impacts in the fish flesh. Since the WLA and LA apply at all times, the TMDL provides for year-round protection of the water quality standard for these pesticides, including periods when critical conditions occur.

Public Participation

This TMDL will be published for a 30-day public notice. During this time, the public will be notified by publication in The Clarion Ledger newspaper. The public will be given an opportunity to review the TMDL and submit comments. MDEQ also distributes all TMDLs at the beginning of the public notice to those members of the public who have requested to be included on a TMDL mailing list. TMDL mailing list members may request to receive the TMDL reports through either, email or the postal service. Anyone wishing to be included on the TMDL mailing list should contact Kay Whittington at (601) 961-5729 or

Kay_Whittington@deq.state.ms.us. All written comments received during the public notice period become a part of the record of this TMDL. All comments will be considered in the ultimate completion of this TMDL for submission of this TMDL to EPA Region 4 for final approval.

Technical Analysis

Elimination of DDT and Toxaphene in the environment is a worthy goal for this TMDL Report. By proposing this TMDL, MDEQ makes these watersheds eligible for additional Section 319 nonpoint source pollution funding. The Section 319 Grant, which addresses nonpoint source pollution, was increased in 2001. MDEQ made the decision to use these additional funds on nonpoint source projects that directly deal with TMDL issues. Ongoing agricultural efforts such as CRP, WRP, and EQUIP also support improved water quality through installation of best management practices. The 2002 Farm Bill has an increase in conservation practices also aimed at improving water quality. Therefore it is hoped that the use of best management practices in these watersheds will be accelerated.

Prior to receiving these funds, watershed plans need to be produced and prioritized by the Big Black River Basin Team. It is also important to include local input on each of these pollutant problems through the Basin Teams.

BMPs installed in this watershed that keeps the sediment on the fields and out of the stream will also keep DDT and Toxaphene out of the streams and ultimately reduce the levels available for the fish flesh. The result of implementing these BMPs will achieve dual improvements for the watershed that is sediment reduction and pesticide reduction.

Supporting Documentation

Mississippi Department of Environmental Quality. 2001. Mississippi Delta Fish Tissue Study 2000 Final Report October 31, 2001, Mississippi Department of Environmental Quality. Jackson, MS.

United States Environmental Protection Agency (USEPA). 1995. Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 1: Fish Sampling and Analysis, Second Edition. U.S. Environmental Protection Agency, Office of Water. Washington, D.C. EPA 823-R-95-007.

United States Fish and Wildlife Service (USFWS). 1990. Schmitt, C.J., J.L. Zajicek, and P.L. Peterman. National Contaminant Biomonitoring Program: Residues of organochlorine chemicals in freshwater fishes of the United States, 1976-1984.

Archives of Environmental Contamination and Toxicology. 10:748-782.

United States Geological Survey (USGS). 1997. Kleiss, B.A. and B.G. Justus. U.S. Geological Survey. Proceedings of the 1997 Mississippi Water Resources Conference. Preliminary results of fish tissue analysis from the Mississippi Embayment of the NAWQA Program. Raymond, MS.