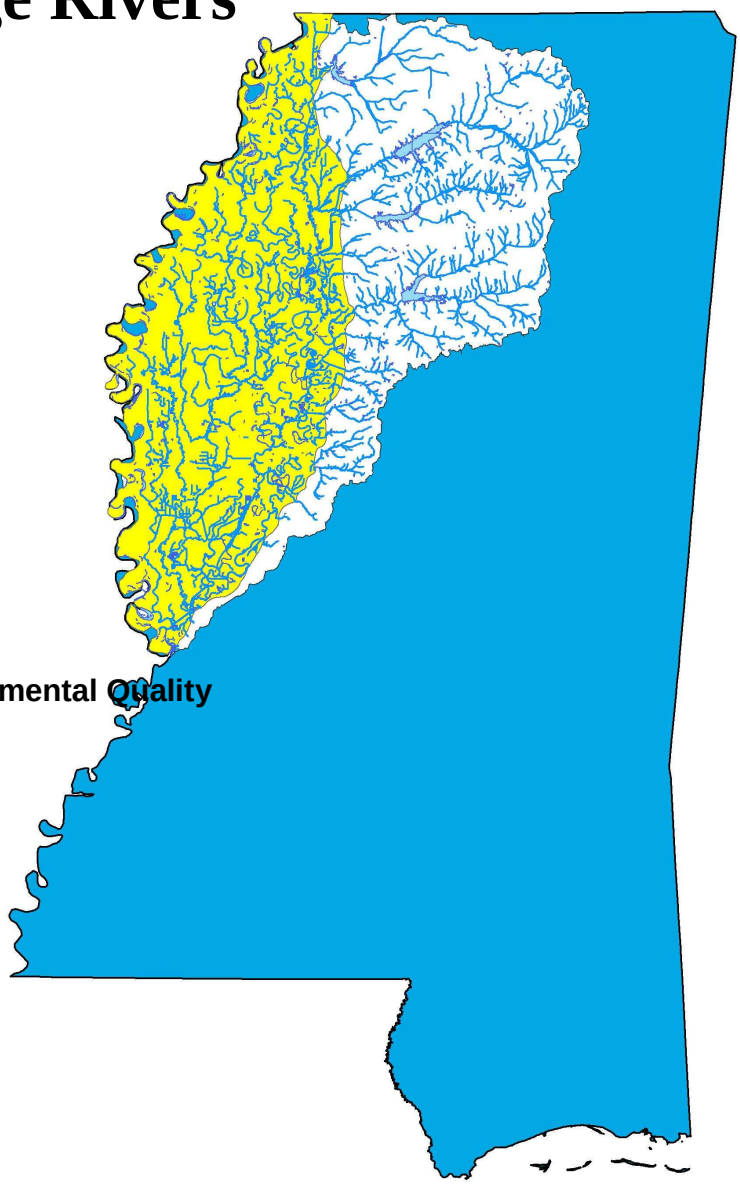
FINAL REPORT
June 2008
ID: 908063054

Total Maximum Daily Load

Total Nitrogen and Total Phosphorus For Selected Large Rivers in the Delta



Yazoo River Basin

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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 Water bodies. Because of 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.

Conversion Factors

To convert from	To	Multiply by	To convert from	To	Multiply by
$mile^2$	acre	640	acre	ft^2	43560
km^2	acre	247.1	days	seconds	86400
m^3	ft^3	35.3	meters	feet	3.28
ft^3	gallons	7.48	ft^3	gallons	7.48
ft^3	liters	28.3	hectares	acres	2.47
cfs	gal/min	448.8	miles	meters	1609.3
cfs	MGD	0.646	tonnes	tons	1.1
m^3	gallons	264.2	µg/l * cfs	gm/day	2.45
m^3	liters	1000	µg/l * MGD	gm/day	3.79

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

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TMDL INFORMATION

Table 1. Listing Information

Name	ID	County	HUC	Evaluated Cause
Lower Auxiliary Channel	MSLOWAUXE	Humphreys, Yazoo	08030207	Total Nitrogen and Total Phosphorus
Steele Bayou	MS404E	Washington, Issaquena	08030209	Total Nitrogen and Total Phosphorus
Tallahatchie River	MSTALARE	Quitman, Tallahatchie	08030202	Total Nitrogen and Total Phosphorus
Tallahatchie River	MSUTALARE	Tallahatchie	08030202	Total Nitrogen and Total Phosphorus
Yalobusha River	MSYLBUSHE	Grenada, Leflore	08030205	Total Nitrogen and Total Phosphorus
Yazoo River	MSYAZR1E	Yazoo, Warren	08030208	Total Nitrogen and Total Phosphorus
Yazoo River	MSYAZR2E	Yazoo, Humphreys	08030207	Total Nitrogen and Total Phosphorus
Yazoo River	MSYAZR3E	Leflore, Humphreys	08030206	Total Nitrogen and Total Phosphorus

Table 2. Water Quality Standards

Parameter	Beneficial use	Water Quality Criteria
Nutrients	Aquatic Life Support	Waters shall be free from materials attributable to municipal, industrial, agricultural, or other dischargers producing color, odor, taste, total suspended solids, or other conditions in such degree as to create a nuisance, render the waters injurious to public health, recreation, or to aquatic life and wildlife, or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated uses.

Table 3. Total Maximum Daily Load for the Delta

	WLA lbs/day	LA lbs/day	MOS	TMDL lbs/day
Total Nitrogen	13,450.7	103,097.1	Implicit	116,547.8*
Total Phosphorous	2,275.9	15,483.8	Implicit	17,759.7*

*TMDL applies such that TN and TP targets will be met in each of the impaired segments

Table 4. Point Source Loads

Facility	Permit	Flow MGD	TN Load (lb/day)	TP Load (lb/day)
Belzoni POTW	MS0020371	1.3	124.8	56.4
Clarksdale POTW	MS0020311	5.0	567.5	242.0
Cleveland POTW	MS0020567	3.0	287.9	130.2
Confish	MS0043346	0.286	29.8	501.2
Ergon Refining	MS0034711	Report	262.0	1.4
Fresh Water Farms	MS0048551	0.28	257.0	14.0
Greenwood POTW	MS0023833	6.32	865.0	311.2
Grenada POTW	MS0020397	3.4	326.3	147.5
Humphreys Academy	MS0048003	0.008	0.8	0.3
Indianola POTW	MS0024619	2.25	215.9	97.6
International Paper	MS0000191	20.14	4,154.0	517.3
Philip Water and Sewer Assoc.	MS0055361	0.08	7.7	3.5
Silver City POTW	MS0044709	0.06	5.8	2.8
TT and W Farm Products	MS0051098	1.4	1,285.2	70.1
Terra Mississippi Nitrogen	MS0000574	5.58	4,773.0	50.0
Three Forks LLC	MS0059552	0.0015	0.1	0.1
Yazoo City POTW	MS0020389	3.0	287.9	130.2

EXECUTIVE SUMMARY

This TMDL has been developed for selected large rivers in the Delta which were placed on the Mississippi 2006 Section 303(d) List of Impaired Water Bodies due to evaluated causes of nutrients shown in Figure 1. Any other evaluated causes of impairment will be addressed in separate TMDL reports. This TMDL will provide an estimate of the total nitrogen (TN) and total phosphorus (TP) allowable in these water bodies.

Mississippi does not have water quality standards for allowable nutrient concentrations. MDEQ currently has a Nutrient Task Force (NTF) working on the development of criteria for nutrients. An annual concentration of 1.05 mg/l is an applicable target for TN and 0.16 mg/l for TP for water bodies located in the west side of the Delta. MDEQ is presenting these preliminary target values for TMDL development which are subject to revision after the development of numeric nutrient criteria.

There are seven 7 large river segments included in this TMDL, which are listed in Table 1 and shown in Figure 1. This TMDL focuses on the big picture of large rivers and major and direct point sources in the Delta, which are listed in Table 4.

The limited nutrient information and estimated existing concentrations indicate reductions of nutrients can be accomplished with implementation of best management practices (BMPs).

INTRODUCTION

1.1 Background

The identification of water bodies not meeting their designated use and the development of total maximum daily loads (TMDLs) for those water bodies are required by Section 303(d) of the Clean Water Act and the Environmental Protection Agency's (EPA) Water Quality Planning and Management Regulations (40 CFR part 130). The TMDL process is designed to restore and maintain the quality of those impaired water bodies through the establishment of pollutant specific allowable loads. This TMDL has been developed for the 2006 §303(d) listed segments shown in Figure 1.

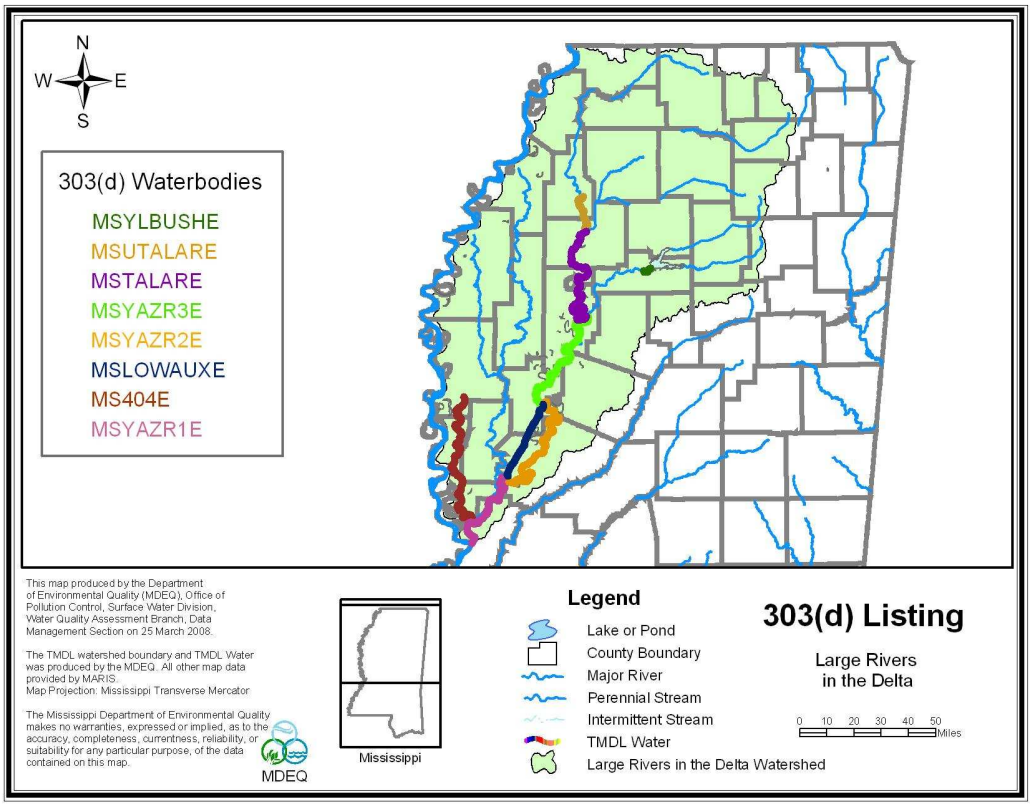


Figure 1. §303(d) Listed Large Rivers in the Delta

1.2 Listing History

The segments were originally listed by evaluating the basin for water bodies that were potentially impaired due to activities within the watersheds. There are no state criteria in Mississippi for nutrients. These criteria are currently being developed by the Mississippi Nutrient Task Force in coordination with EPA Region 4. MDEQ proposed a work plan for nutrient criteria development that has been mutually agreed upon with EPA Region 4 and is on schedule according to the approved timeline for development of nutrient criteria (MDEQ, 2007).

1.3 Applicable Water Body Segment Use

The water use classifications are established by the State of Mississippi in the document *State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters* (MDEQ, 2007). The designated beneficial use for the listed segments is Fish and Wildlife.

1.4 Applicable Water Body Segment Standard

The water quality standard applicable to the use of the water body and the pollutant of concern is defined in the *State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters* (MDEQ, 2007).

Mississippi's current standards contain a narrative criteria that can be applied to nutrients which states "*Waters shall be free from materials attributable to municipal, industrial, agricultural, or other discharges producing color, odor, taste, total suspended or dissolved solids, sediment, turbidity, or other conditions in such degree as to create a nuisance, render the waters injurious to public health, recreation, or to aquatic life and wildlife, or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated use* (MDEQ, 2007)." In the 1999 Protocol for Developing Nutrient TMDLs, EPA suggests several methods for the development of numeric criteria for nutrients (USEPA, 1999). In accordance with the 1999 Protocol, "*The target value for the chosen indicator can be based on: comparison to similar but unimpaired waters; user surveys; empirical data summarized in classification systems; literature values; or professional judgment*." MDEQ believes the most economical and scientifically defensible method for use in Mississippi is a comparison between similar but unimpaired waters within the same region. This method is dependent on adequate data which are being collected in accordance with the current nutrient criteria development plan.

1.5 Nutrient Target Development

Numeric nutrient criteria are not currently available for Delta streams. Biotic indices such as the MBISQ index used to assess attainment of aquatic life use in streams in other parts of Mississippi are also not available for the Delta. Therefore, a percentile approach has been used to suggest nutrient targets applicable for Delta streams, following the approach suggested by EPA (EPA 2000).

USGS data were partitioned into eastern and western nutrient distributions. USGS nutrient data for the western portion of the Delta were combined with MDEQ's WADES nutrient data. These two data distributions were used to derive the nutrient concentration associated with the lower quartile following procedures similar to those used by EPA (2001) in developing nutrient criteria recommendations for rivers and streams. The lower quartile nutrient concentrations associated with these data sets are shown in Table 5 below.

For this TMDL, MDEQ is presenting preliminary targets for TN and TP. An annual concentration 1.05 mg/l is an applicable target for TN and 0.16 mg/l for TP for water bodies located in the west side of the Delta. However, MDEQ is presenting these preliminary target values for TMDL development. Due to the limited data set an applicable target for Large Rivers could not be developed. These targets are considered to be very conservative for larger water

bodies. Therefore, the targets are subject to revision after the development of nutrient criteria, when the work of the NTF is complete.

Table 5. Nutrient Targets for the Delta Wadeable Streams

Lower Quartile Values		
Nutrient Conc. (mg/l)	East (USGS)	West (WADES/USGS)
TP	0.09	0.16
TN	0.58	1.05

WATER BODY ASSESSMENT

2.1 Water Quality Data

Table 6. Available Data

Waterbody ID	Station Location	Date	DO (mg/l)	TN (mg/l)	TP (mg/l)
MSTALARE	AT SUNNY SIDE RD/CR 559	1/13/2000	15.16	0.93	0.14
		2/23/2000	9.69	1.74	0.38
		4/3/2000	7.22	1.7	0.57
		5/11/2000	5.58	2.29	0.5
		6/5/2000	6.36	1.17	0.29
		7/11/2000		0.98	0.2
		11/7/2000		0.87	0.14
		12/28/2000		1.41	0.23
		4/5/2001	9.97	1.02	0.31
		5/24/2001	7.04	1.65	0.32
		6/25/2001	7.72	0.95	0.2
		7/16/2001	7.22	0.88	0.21
		9/12/2001	7.16	0.54	0.09
		10/11/2001	8.38	0.59	0.13
		11/7/2001	9.12	0.67	0.17
		12/6/2001	6.26	1.17	0.24
		Average	**7.64**	**1.16**	**0.26**
MSYAZR3E	AT CR 511	1/13/2000	12.75	1.01	0.12
		2/23/2000	9.86	1.44	0.29
		4/3/2000	6.98	2	0.66
		5/11/2000	5.99	1.9	0.47
		6/5/2000	6.27	1.09	0.21
		7/11/2000	10.07	0.99	0.17
		11/7/2000		0.86	0.27
		12/28/2000		1.03	0.22
		4/5/2001	8.44	1.31	0.46
		6/25/2001	7.33	1.01	0.2
		7/16/2001	6.34	1.68	0.31
		9/12/2001	6.92	0.62	0.09
		10/11/2001	8.4	0.78	0.16
		11/7/2001	9.03	0.85	0.14
		12/6/2001	6.71	1.1	0.41
		Average	**8.08**	**1.18**	**0.28**

2.2 Assessment of Point Sources

This TMDL will focus on nutrient loads from major industrial and municipal point sources in the Delta and those facilities that discharge directly into one of the impaired segments included in this TMDL. The lower order streams in the basin that are potentially impaired by nutrient enrichment are the subject of separate TMDLs and are addressed in separate reports. The minor

facilities are in other TMDLs or will not have an impact on water quality in the segments addressed by the TMDL based on best professional judgment.

The wastewater from the facilities was characterized based upon the best available information. Direct sampling data were used to calculate the TN and TP loads from the industrial discharges (Confish, Ergon Refining, International Paper, and Terra Mississippi Nitrogen, LLC.) These facilities are subject to categorical discharge limitations. These limits are expressed in pounds per day and are a function of production capacity. While this TMDL uses the maximum daily mass limits, the permits also specify a maximum long-term average that significantly reduces the average mass loading. The Environmental Permits Division (EPD) coordinates a review of historic production capacities and in-stream water quality during the permit renewal process. EPD works with the facilities to accurately assess both the maximum daily and long-term average mass loading. Utilizing maximum daily and long-term average loadings encourages consistent management of the treatment system. As a result of this process, Terra Mississippi Nitrogen was able to reduced the maximum daily TN loading from approximately 6,066 lbs/day to approximately 4,773 lbs/day (21.3%) in the recent permit renewal. This review process is applied to all facilities as part of the permit renewal process and may result in further nutrient reductions as appropriate.

Literature values were used to estimate the mass loadings from municipal discharges due to the similarity of the municipal facilities and to account for seasonal variation (USEPA 1999). Discharge monitoring reports were also reviewed.

There are 17 major or direct facilities that are shown in Table 7 and Figure 2 below.

Table 7. NPDES Sources

Facility Name	City	County	Permit	Discharge (MGD)
Belzoni POTW	Belzoni	Humphreys	MS0020371	1.3
Clarksdale POTW	Clarksdale	Coahoma	MS0020311	5.0
Cleveland POTW	Cleveland	Bolivar	MS0020567	3.0
Confish	Belzoni	Humphreys	MS0043346	0.286
Ergon Refining	Vicksburg	Warren	MS0034711	Report
Fresh Water Farms	Belzoni	Humphreys	MS0048551	0.28
Greenwood POTW	Greenwood	Leflore	MS0023833	6.32
Grenada POTW	Grenada	Grenada	MS0020397	3.4
Humphreys Academy	Belzoni	Humphreys	MS0048003	0.008
Indianola POTW	Indianola	Sunflower	MS0024619	2.25
International Paper, Vicksburg Mill	Redwood	Warren	MS0000191	20.14
Philip Water and Sewer Assoc.	Philip	Tallahatchie	MS0055361	0.08
Silver City POTW	Silver City	Humphreys	MS0044709	0.06
TT and W Farm Products	Greenwood	Leflore	MS0051098	1.4
Terra Mississippi Nitrogen	Yazoo City	Yazoo	MS0000574	5.58
Three Forks LLC	Greenwood	Tallahatchie	MS0059552	0.0015
Yazoo City POTW	Yazoo City	Yazoo	MS0020389	3.0

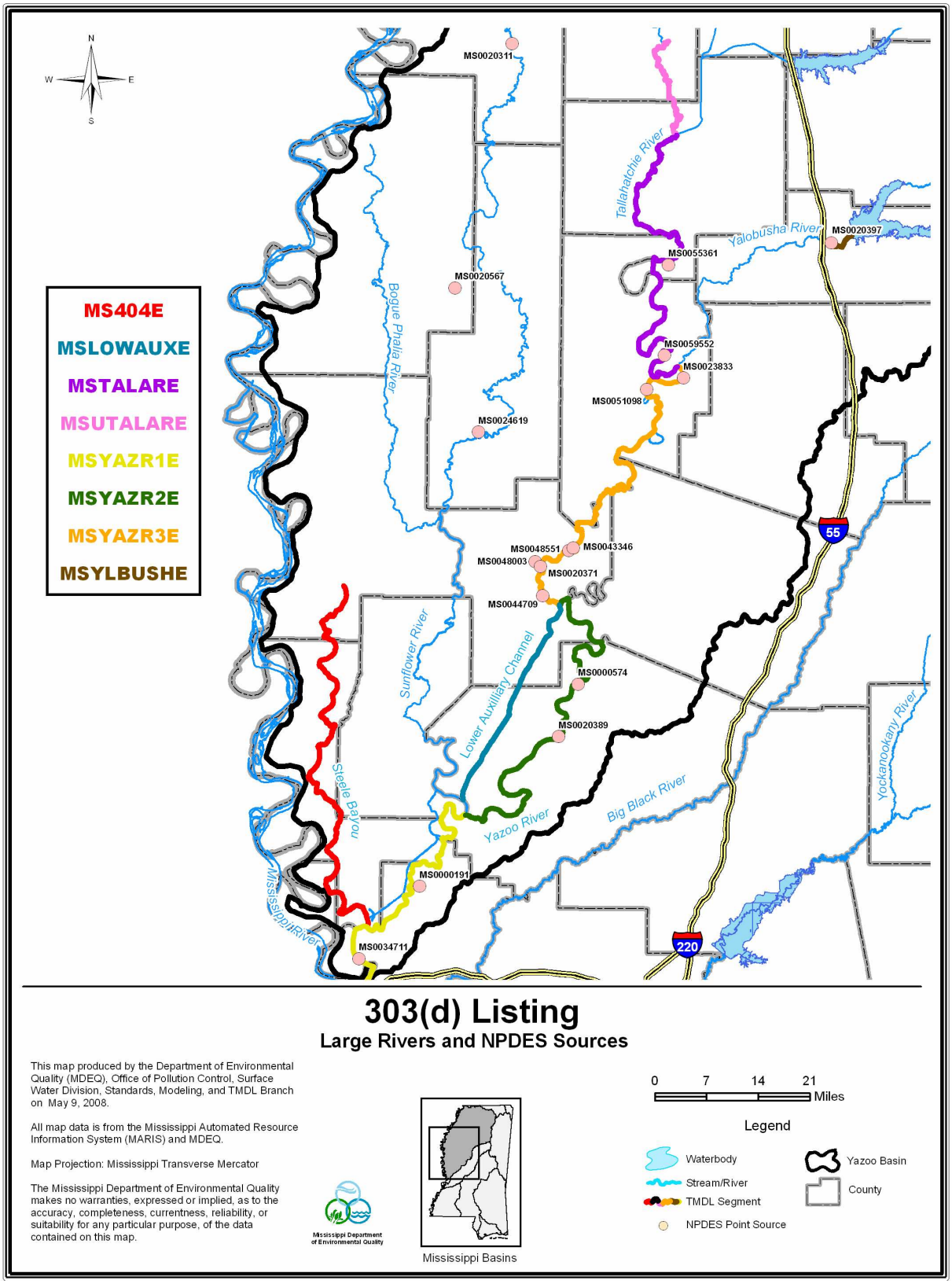


Figure 2. Point Sources

2.3 Assessment of Non-Point Sources

Non-point loading of nutrients and organic material in a water body results from the transport of the pollutants into receiving waters by overland surface runoff, groundwater infiltration, and atmospheric deposition. The two primary nutrients of concern are nitrogen and phosphorus. Total nitrogen is a combination of many forms of nitrogen found in the environment. Inorganic nitrogen can be transported in particulate and dissolved phases in surface runoff. Dissolved inorganic nitrogen can be transported in groundwater and may enter a water body from groundwater infiltration. Finally, atmospheric gaseous nitrogen may enter a water body from atmospheric deposition.

Unlike nitrogen, phosphorus is primarily transported in surface runoff when it has been sorbed by eroding sediment. Phosphorus may also be associated with fine-grained particulate matter in the atmosphere and can enter streams as a result of dry fallout and rainfall (USEPA, 1999). However, phosphorus is typically not readily available from the atmosphere or the natural water supply (Davis and Cornwell, 1988). As a result, phosphorus is typically the limiting nutrient in most non-point source dominated rivers and streams, with the exception of watersheds which are dominated by agriculture and have high concentrations of phosphorus contained in the surface runoff due to fertilizers and animal excrement or watersheds with naturally occurring soils which are rich in phosphorus (Thomann and Mueller, 1987).

Watersheds with a large number of failing septic tanks may also deliver significant loadings of phosphorus to a water body. All domestic wastewater contains phosphorus which comes from humans and the use of phosphate containing detergents. Tables 8 presents the estimated loads from various land use types in the Delta based on information from USDA ARS Sedimentation Laboratory (Shields, et. al., 2008).

The Delta contains mainly cropland but also has different landuse types, including urban, water, and wetlands. The Yazoo Hills area is predominately forested. The landuse information given below is based on the National Land Cover Dataset (NLCD). The landuse distribution for the Yazoo Hills is shown in Table 8 and Figure 3. The landuse distribution for the Delta is shown in Table 9 and Figure 3. By multiplying the landuse category size by the estimated nutrient load, the watershed specific estimate can be calculated. Table 9 presents the total estimated loads From the Yazoo Hills and the Delta.

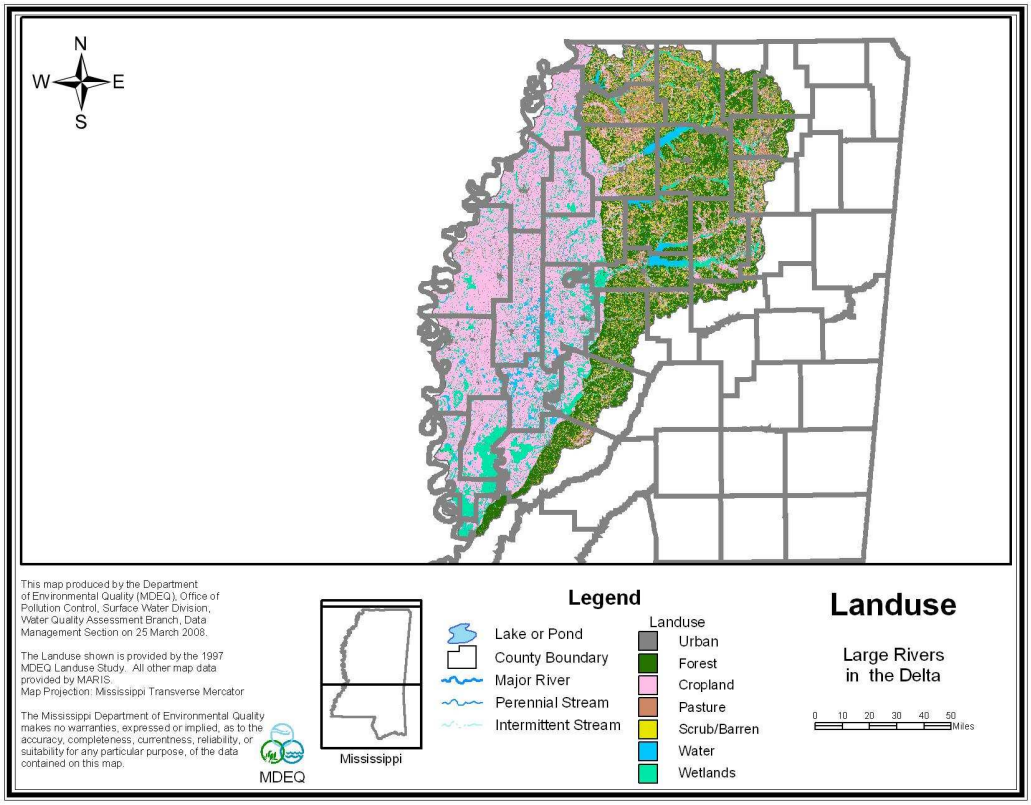
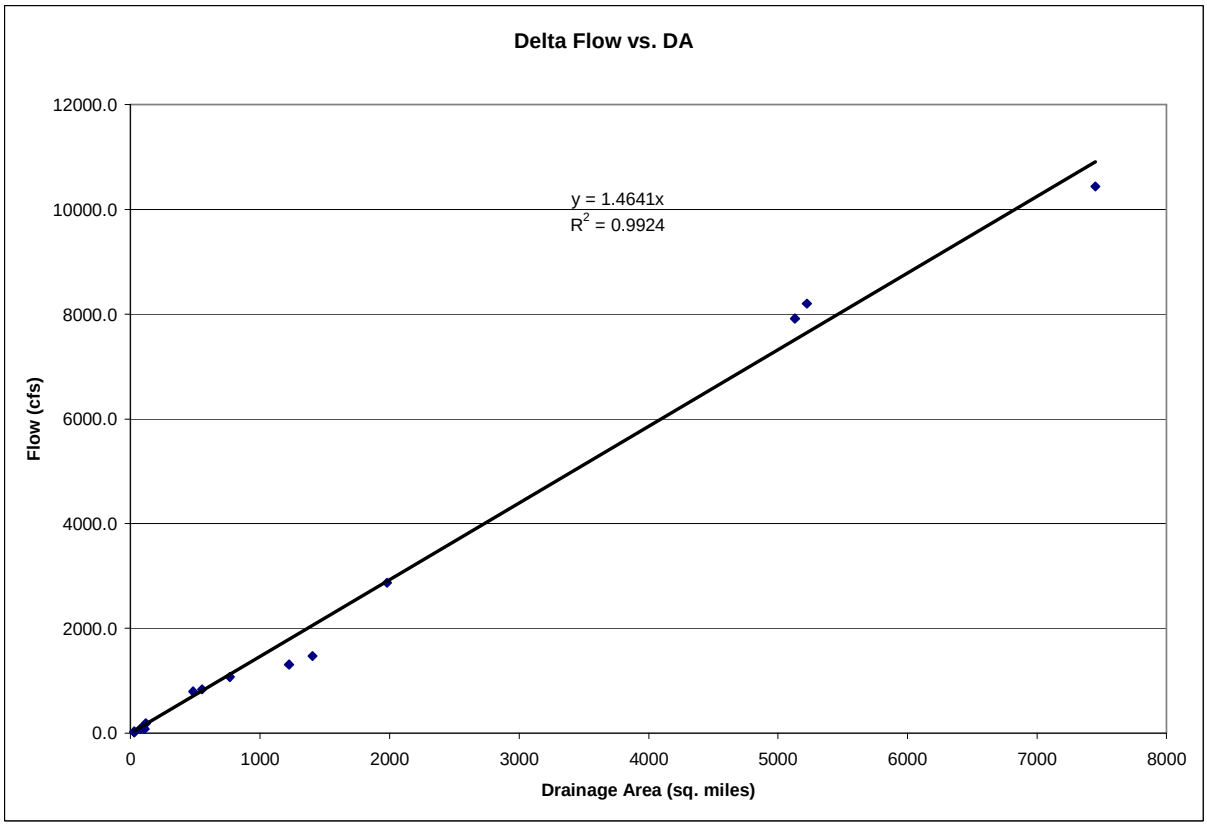


Figure 3. Landuse in the Yazoo Basin

2.4 Estimated Existing Load for Total Nitrogen and Total Phosphorus

The average annual flow in the basin was calculated by utilizing the flow vs. area graph shown in figure 4 below. All available gages were compared to the watershed size. A very strong correlation between flow and watershed size was developed for the basin. The equation for the line that best fits the data was then used to estimate the annual average flow for the basin. The TMDL target TN and TP loads were then calculated, using Equation 1 and the results are shown in Table 10.

Figure 4. Delta Drainage Area to Flow Comparison



Nutrient Load (lb/day) = Flow (cfs) * 5.394 (conversion factor)* Nutrient Concentration (mg/L) (Equation 1)

Table 8. Estimated Loads for the Yazoo Hills

			Water	Urban	Scrub/Barren	Forest	Pasture/Grass	Cropland	Wetland	Total	
		Acres	130,245.1	234,047.4	587,207.8	1,899,907.3	634,094.0	566,544.6	273,766.7	4,325,813.0	
Land Use	**TN kg/mile^2**	Percent	3.01%	5.41%	13.57%	43.92%	14.66%	13.10%	6.33%	100.00%	
Forest	111.3	Miles^2 in watershed	203.5	365.7	917.5	2,968.6	990.8	885.2	427.8	6,759.1	
Pasture	777.2	Flow in cfs based on area	9,896.0	cfs							
Cropland	5,179.9										
Urban	296.4	TN Load kg/mi^2 annual avg	257.4	296.4	111.3	111.3	777.2	5179.9	265.2		
Water	257.4	TP Load kg/mi^2 annual avg	257.4	3.1	62.1	62.1	777.2	2589.9	265.2		
Wetland	265.2										
Scrub/Barren	111.3	TN Load kg/day	143.5	297.0	279.8	905.4	2,109.7	12,562.7	310.8	16,608.8	kg/day
		TP Load kg/day	143.5	3.1	156.1	505.1	2,109.7	6,281.2	310.8	9,509.5	kg/day
Land Use	**TP kg/mile^2**										
Forest	62.1	TN estimated load per day	3,6616.21	lbs/day							
Pasture	777.2	TP estimated load per day	20,964.87	lbs/day							
Cropland	2,589.9										
Urban	3.1										
Water	257.4										
Wetland	265.2										
Scrub/Barren	62.1										

The land use calculations are based on 2004 data. The nutrient estimates are based on USDA ARS. The TMDL targets are based on EPA guidence for calculation of targets when considering all available data.

Table 9. Estimated Loads from the Delta

			Water	Urban	Scrub/Barren	Forest	Pasture/Grass	Cropland	Wetland	Total	
		Acres	270,388.1	251,567.5	32,586.6	1,1087.5	22,839.5	3,136,869.9	944,416.2	4,669,755.3	
Land Use	**TN kg/mile^2**	Percent	5.8%	5.4%	0.7%	0.2%	0.5%	67.2%	20.2%	100.0%	
Forest	111.3	Miles^2 in watershed	422.5	393.1	50.9	17.3	35.7	4,901.4	1,475.7	7,296.5	
Pasture	777.0	Flow in cfs based on area	10,682.8	cfs							
Cropland	10,956.2										
Urban	287.8	TN Load kg/mi^2 annual avg	259.0	287.8	111.3	111.3	777.0	10,956.2	259.0		
Water	259.0	TP Load kg/mi^2 annual avg	259.0	4.3	61.3	61.3	1,295.0	5,490.9	259.0		
Wetland	259.0										
aquaculture	2,590.0	TN Load kg/day	299.8	309.9	15.5	5.3	76.0	147,123.9	1,047.1	148,877.5	kg/day
		TP Load kg/day	299.8	4.6	8.6	2.9	126.6	73,734.0	1,047.1	75,223.6	kg/day
Land Use	**TP kg/mile^2**										
Forest	61.3	TN estimated load per day	328,218.64	lbs/day							
Pasture	1,295.0	TP estimated load per day	165,839.76	lbs/day							
Cropland	5,490.9										
Urban	4.3										
Water	259.0										
Wetland	259.0										
aquaculture	2,590.0										

The land use calculations are based on 2004 data. The nutrient estimates are based on USDA ARS. The TMDL targets are based on EPA guidence for calculation of targets when considering all available data.

Table 10. Existing Loads

	Yazoo Hills	Delta	Total
TN	36,616.2	328,218.6	364,834.8
TP	20,964.9	165,839.8	186,804.7

ALLOCATION

3.1 Wasteload Allocation

There are 17 major or direct discharge NPDES point sources. As discussed in Section 2.3, the WLA is calculated using the maximum daily mass loading as a conservative measure. The calculations are shown in Table 11 below. The WLA portion of the TMDL is 2,275.9 lbs. TP and 13,450.7 lbs. TN. This is 11.5% of the TMDL for TN and 12.8% of the TMDL for TP. This TMDL recommends quarterly monitoring of TN and TP at these facilities. As discussed in Section 2.2, many of these facilities are subject to 30-day or long term permit limits. The use of maximum daily flows to calculate mass loading compounds the potential for greater pollutant loadings. The use of average flows for mass loading calculations promotes consistent management of the treatment system. The average mass loadings are also more representative of the actual load discharged to water bodies. For reference, the point source contributions have also been calculated with average permit limits and are shown in Table 12 below. Using average values the point sources represent 7.2% and 11.4% of the TMDL for TN and TP, respectively. Future permits will be considered in accordance with Mississippi's *Wastewater Regulations for National Pollutant Discharge Elimination System (NPDES) Permits, Underground Injection Control (UIC) Permits, State Permits, Water Quality Based Effluent Limitations and Water Quality Certification*(1994).

Table 11. Point Source Contribution

Facility	City	County	Type	Permit #	Discharge (MGD)	TP (mg/l)	TN (mg/l)	Total P (lbm/day)	Total N (lbm/day)
Belzoni POTW	Belzoni	Humphreys	M	MS0020371	1.3	5.2	11.5	56.4	124.8
Clarksdale POTW	Clarksdale	Coahoma	M	MS0020311	5	5.8	13.6	242.0	567.5
Cleveland POTW	Cleveland	Bolivar	M	MS0020567	3	5.2	11.5	130.2	287.9
Confish	Belzoni	Humphreys	I	MS0043346	0.286	210	12.5	501.2	29.8
Ergon Refining, Inc.	Vicksburg	Warren	I	MS0034711	Report	N/A	N/A	1.4	262.0
Freshwater Farms, Inc.	Belzoni	Humphreys	I	MS0048551	0.28	6	110.0	14.0	257.0
Greenwood POTW	Greenwood	Leflore	M	MS0023833	6.32	5.9	16.4	311.2	865.0
Grenada POTW	Grenada	Grenada	M	MS0020397	3.4	5.2	11.5	147.5	326.3
Humphreys Academy	Belzoni	Humphreys	M	Ms0048003	0.008	5.2	11.5	0.3	0.8
Indianola POTW	Indianola	Sunflower	M	MS0024619	2.25	5.2	11.5	97.6	215.9
International Paper, Vicksburg Mill	Redwood	Warren	I	MS0000191	20.14	N/A	N/A	517.3	4,154.0
Phillip Water and Sewer Assoc.	Philip	Tallahatchie	M	MS0055361	0.08	5.2	11.5	3.5	7.7
Silver City POTW	Silver City	Humphreys	M	MS0044709	0.06	5.5	11.5	2.8	5.8
T T and W Farm Products, Inc	Greenwood	Leflore	I	MS0051098	1.4	6	110	70.1	1,285.2
Terra Mississippi Nitrogen Inc.	Yazoo City	Yazoo	I	MS0000574	5.58	N/A	N/A	50.0	4773.0
Three Forks LLC	Greenwood	Tallahatchie	M	MS0059552	0.0015	5.2	11.5	0.1	0.1
Yazoo City POTW	Yazoo City	Yazoo	M	MS0020389	3	5.2	11.5	130.2	287.9
							Total (lbm/day)	**2,275.9**	**13,450.7**

Table 12. Point Source Contribution (Average Flow)

Facility	City	County	Type	Permit #	Discharge (MGD)	TP (mg/l)	TN (mg/l)	TP (lbm/day)	Total N (lbm/day)
Belzoni POTW	Belzoni	Humphreys	M	MS0020371	1.3	5.2	11.5	56.4	124.8
Clarksdale POTW	Clarksdale	Coahoma	M	MS0020311	5	5.8	13.6	242.0	567.5
Cleveland POTW	Cleveland	Bolivar	M	MS0020567	3	5.2	11.5	130.2	287.9
Confish	Belzoni	Humphreys	I	MS0043346	0286	210	12.5	254.2	15.1
Ergon Refining, Inc.	Vicksburg	Warren	I	MS0034711	Report	N/A	N/A	1.4	262.0
Freshwater Farms, Inc.	Belzoni	Humphreys	I	MS0048551	0.28	6	110.0	14.0	257.0
Greenwood POTW	Greenwood	Leflore	M	MS0023833	6.32	5.9	16.4	311.2	865.0
Grenada POTW	Grenada	Grenada	M	MS0020397	3.4	5.2	11.5	147.5	326.3
Humphreys Academy	Belzoni	Humphreys	M	Ms0048003	0.008	5.2	11.5	0.3	0.8
Indianola POTW	Indianola	Sunflower	M	MS0024619	2.25	5.2	11.5	97.6	215.9
International Paper, Vicksburg Mill	Redwood	Warren	I	MS0000191	20.14	N/A	N/A	517.3	2,026.0
Phillip Water and Sewer Assoc.	Philip	Tallahatchie	M	MS0055361	0.08	5.2	11.5	3.5	7.7
Silver City POTW	Silver City	Humphreys	M	MS0044709	0.06	5.5	11.5	2.8	5.8
T T and W Farm Products, Inc	Greenwood	Leflore	I	MS0051098	1.2	6	110	40.1	734.4
Terra Mississippi Nitrogen Inc.	Yazoo City	Yazoo	I	MS0000574	5.58	N/A	N/A	50.0	2,279.0
Three Forks LLC	Greenwood	Tallahatchie	M	MS0059552	0.0015	5.2	11.5	0.1	0.1
Yazoo City POTW	Yazoo City	Yazoo	M	MS0020389	3	5.2	11.5	130.2	287.9
							Total (lbm/day)	**2,018.7**	**8,429.7**

3.2 Load Allocation

Best management practices should be encouraged in the watersheds to reduce potential TN and TP loads from non-point sources. For land disturbing activities related to silvaculture, construction, and agriculture, it is recommended that practices, as outlined in "Mississippi's BMPs: Best Management Practices for Forestry in Mississippi" (MFC, 2000), "Planning and Design Manual for the Control of Erosion, Sediment, and Stormwater" (MDEQ, et. al, 1994), and "Field Office Technical Guide" (NRCS, 2000), be followed, respectively.

3.3 Incorporation of a Margin of Safety

The margin of safety is a required component of a TMDL and accounts for the uncertainty about the relationship between pollutant loads and the quality of the receiving water body. The two types of MOS development are to implicitly incorporate the MOS using conservative model assumptions or to explicitly specify a portion of the total TMDL as the MOS. The MOS selected for this model is implicit.

3.4 Calculation of the TMDL

A predictive model was not used to calculate the TMDL. Equation 1 was used to calculate the TMDL for TP and TN. The target concentration was used with the average flow for the watershed to determine the TMDL.

The nutrient TMDL loads were then compared to the estimated existing loads previously calculated. Best management practices are encouraged in this watershed to reduce the nonpoint nutrient loads.

Table 13. Calculation of the TMDL

	Flow (MGD)	Concentration	TMDL	% Reduction
TP	13,300.5	0.16	17,759.7*	85.3
TN	13,300.5	1.05	116,547.8*	68.1

*TMDL applies such that TN and TP targets will be met in each of the impaired segments

3.5 Seasonality and Critical Condition

This TMDL accounts for seasonal variability by requiring allocations that ensure year-round protection of water quality standards, including during critical conditions.

CONCLUSION

Nutrients were addressed through an estimate of a preliminary total phosphorous concentration target and a preliminary total nitrogen concentration target. Based on the estimated existing and target total phosphorous concentrations, this TMDL recommends a 85.3% reduction of the phosphorous loads entering these water bodies to meet the preliminary target of 0.16 mg/l. Based on the estimated existing and target total nitrogen concentrations, this TMDL recommends a 68.1 % reduction of the nitrogen loads entering these water bodies to meet the preliminary target of 1.05 mg/l. The implementation of these BMP activities should reduce the nutrient load entering the creeks. This will provide improved water quality for organic enrichment and the support of aquatic life in the water bodies, and will result in the attainment of the applicable water quality standards. This TMDL also recommends quarterly monitoring of TN and TP at the listed facilities.

4.1 Next Steps

MDEQ's Basin Management Approach and Nonpoint Source Program emphasize restoration of impaired waters with developed TMDLs. During the watershed prioritization process to be conducted by the Yazoo River Basin Team, this TMDL will be considered as a basis for implementing possible restoration projects. The basin team is made up of state and federal resource agencies and stakeholder organizations and provides the opportunity for these entities to work with local stakeholders to achieve quantifiable improvements in water quality. Together, basin team members work to understand water quality conditions, determine causes and sources of problems, prioritize watersheds for potential water quality restoration and protection activities, and identify collaboration and leveraging opportunities. The Basin Management Approach and the Nonpoint Source Program work together to facilitate and support these activities.

The Nonpoint Source Program provides financial incentives to eligible parties to implement appropriate restoration and protection projects through the Clean Water Act's Section 319 Nonpoint Source (NPS) Grant Program. This program makes available around $1.6M each grant year for restoration and protections efforts by providing a 60% cost share for eligible projects.

Mississippi Soil and Water Conservation Commission (MSWCC) is the lead agency responsible for abatement of agricultural NPS pollution through training, promotion, and installation of BMPs on agricultural lands. USDA Natural Resource Conservation Service (NRCS) provides technical assistance to MSWCC through its conservation districts located in each county. NRCS assists animal producers in developing nutrient management plans and grazing management plans. MDEQ, MSWCC, NRCS, and other governmental and nongovernmental organizations work closely together to reduce agricultural runoff through the Section 319 NPS Program.

Mississippi Forestry Commission (MFC), in cooperation with the Mississippi Forestry Association (MFA) and Mississippi State University (MSU), have taken a leadership role in the development and promotion of the forestry industry Best Management Practices (BMPs) in Mississippi. MDEQ is designated as the lead agency for implementing an urban polluted runoff control program through its Stormwater Program. Through this program, MDEQ regulates most construction activities. Mississippi Department of Transportation (MDOT) is responsible for implementation of erosion and sediment control practices on highway construction.

Due to this TMDL, projects within this watershed will receive a higher score and ranking for funding through the basin team process and Nonpoint Source Program described above.

4.2 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 statewide newspaper. The public will be given an opportunity to review the TMDLs 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. Anyone wishing to become a member of the TMDL mailing list should contact Kay Whittington at Kay_Whittington@deq.state.ms.us.

All comments should be directed to Kay_Whittington@deq.state.ms.us or Kay Whittington, MDEQ, PO Box 10385, Jackson, MS 39289. All comments received during the public notice period and at any public hearings become a part of the record of this TMDL and will be considered in the submission of this TMDL to EPA Region 4 for final approval.

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