

# **Mississippi Consolidated Assessment and Listing Methodology 2014 Assessment and Listing Cycle**

## **Data Requirements and Assessment and Listing Methodology to Fulfill the Requirements of Sections 305(b) and 303(d) of the Clean Water Act**

### **INTRODUCTION**

This document is Mississippi's Consolidated Listing and Assessment Methodology (CALM) for the 2014 Section 305(b) and Section 303(d) reporting cycle. It is subject to revision in subsequent reporting cycles.

#### **Purpose**

A primary goal of surface water quality assessments, as required by Section 305(b) of the federal Clean Water Act (CWA), is to describe the condition of the state's surface waters to the U. S. Environmental Protection Agency (EPA) and the public. A secondary goal of the §305(b) assessment process is to provide the assessment information needed by the Mississippi Department of Environmental Quality (MDEQ) to develop the state's CWA Section 303(d) List of Impaired Water Bodies. To achieve these goals, it is necessary to have requirements and guidelines for how water quality data are collected, analyzed, and assessed. The purpose of this document is to specify the MDEQ's data requirements and assessment guidelines for the 2014 §305(b) assessment and §303(d) listing cycle. This assessment and listing methodology establishes a process, consistent with EPA guidance, to assess the status of surface waters in Mississippi.

#### **Assessment and Listing Process**

All data used to make formal assessments of the quality of the state's waters, regardless of its source, will be evaluated in keeping with the requirements and guidelines contained herein. Monitoring data and information that may be considered when assessing state waters could include chemical, physical, bacteriological, toxicological, and/or biological (e.g., macroinvertebrate, fish, and algal community measurements) data. In addition to using MDEQ-generated data, MDEQ solicits and considers all readily available data and information within the assessment window collected by other Federal, State, local agencies/organizations, and the public. This data solicitation effort is facilitated through MDEQ's Basin Management Approach.

The water quality assessment process begins with the collection and compilation of the available data followed by the analysis of water quality data and information for the purpose of determining the quality of the state's surface water resources. Surface waters in Mississippi are used for a number of purposes. Waters are used for drinking and food processing, shellfishing, recreation, fishing, and aquatic life support. Water bodies are designated and assigned various use classifications by MDEQ in the state's Water Quality Standards ([11 Miss. Admin. Code Pt. 6, Ch. 2](#)) {WQS}. This designation is

made based on the use(s) of the water body as identified by the public and other entities. The use classifications and associated USEPA designated uses for water quality assessment purposes recognized by the State of Mississippi are as follows:

<b>Use Classification</b>	<b>USEPA Associated Designated Use</b>
Public Water Supply	Drinking Water Supply
Recreation	Contact Recreation
Fish and Wildlife	Aquatic Life Use, Fish Consumption, Secondary Contact Recreation
Shellfish Harvesting	Shellfish Consumption

Most of Mississippi's waters are classified as Fish and Wildlife. For each of the use classifications listed above, there are various water quality criteria that apply to those water body uses. These standards are used in the assessment process. A water body (part or all of a stream, river, lake, estuary or coastline) should support one or more of these uses. A full copy of the WQS can be found in Appendix C.

Mississippi's WQS specify the appropriate levels for which various water quality parameters or indicators support a water body's designated use(s). Each use assessed for a water body is determined to be either "Attaining" or "Not Attaining" in accordance with the applicable water quality standards and EPA guidelines for assessments pursuant to §305(b).

After assessing attainment status of the water body's designated use(s), each water body is assigned to an assessment unit that defines the length of the reach assessed and is placed into one of five assessment categories as per EPA guidance. These categories are summarized below in Table 1.

**Table 1**

<b>Assessment Categories</b>	<b>Definitions of Categories</b>
Category 1	Attaining all uses
Category 2	Attaining some uses but there is insufficient data to determine if remaining designated uses are met
Category 3	Insufficient data to determine whether any designated uses are met
Category 4	Not attaining a use but a TMDL is not needed
4A	- TMDL has been completed
4B	- other required control measures will result in attainment of WQS
4C	- impairment or threat not caused by a pollutant
Category 5	Not attaining a use and a TMDL is needed

Where data and information of appropriate quality and quantity indicate non-attainment of a designated use or uses and a Total Maximum Daily Load (TMDL) is needed for an assessed water body (Category 5), the water body pollutant combination will be placed on Mississippi's 2014 §303(d) List of Impaired Water Bodies.

## **Data Quality and Assessment Window**

MDEQ's ability to make meaningful and scientifically defensible statements about the overall water quality of a water body depends directly on the rigor and quality under which the water quality data are collected, analyzed, and reported. In order to ensure consistent and accurate decision-making for water quality assessments, MDEQ maintains a strong commitment to using only high quality data that are accompanied by acceptable quality assurance (QA) information that meet the established minimum data requirements. The selection of minimum data requirements for water quality assessment is intended to ensure that the most accurate water quality conditions are portrayed and to help minimize the probability of making an erroneous assessment. Data generated by MDEQ, other agencies, and individuals should also be of the quality necessary to make credible and realistic assessment decisions on the condition of the state's waters. Whenever possible, data need to be of the highest quality and developed using sampling and analytical protocols and standard operating procedures (SOPs) recognized by state and EPA quality assurance program plans (QAPPs). As such, no data will be assessed for the §305(b)/§303(d) process without supporting quality assurance documentation.

In most cases, MDEQ will use the most recent five years of readily available data. This data includes MDEQ and Non-MDEQ generated data. For the 2014 §305(b) Report, the data window is 2008-2012. According to EPA guidance, data more than five years old may be used on a case-by-case basis if the data are considered representative of present water quality conditions.

## **2014 CALM USE SUPPORT DETERMINATION GUIDELINES**

MDEQ will utilize the following guidelines for data quality, data quantity, and data assessment for data used in the 2014 §305(b) assessment and §303(d) listing process. These guidelines apply, as appropriate, to rivers, streams, lakes, estuaries, and coastal waters.

### **AQUATIC LIFE USE SUPPORT (ALUS)**

The aquatic life designated use is indicative of healthy aquatic life for such organisms as fish, benthic macroinvertebrates, and periphyton (algae). Indicators appropriate for use in ALUS determinations include biological, chemical/physical, and toxicological data. Biological community surveys are preferred datasets for ALUS determinations as these data directly measure the overall biological or ecological condition of a water body by responding to the effects of multiple chemical and physical stressors and/or conditions and integrating these effects over time. MDEQ has compiled an extensive benthic database and employed rigorous scientific methodology in the development of the Mississippi Benthic Index of Stream Quality (M-BISQ), an Index of Biological Integrity (IBI) for Mississippi freshwater wadeable streams. Biological measures are direct, integrative, and compelling indicators of water quality and aquatic life use condition. For this reason, where water chemical data are limited but biological indicator data exist, MDEQ considers the biological information sufficient for assessing aquatic life use and will weigh that information appropriately. When sufficient quantity of each type of data

exist, all data will be considered. Use of M-BISQ is appropriate in freshwater Wadeable streams statewide with the exception of the Mississippi Alluvial Plain (Mississippi Delta) streams.

### **Biological Community Data (Benthic Macroinvertebrates)**

#### **Data Quantity:**

1. Minimum of one benthic macroinvertebrate community (i.e., bottom-dwelling aquatic insects, worms, clams, etc.) survey within the applicable §305(b) reporting period.
2. Sample collection methods, lab processing, taxonomy and enumeration methods are compatible with MDEQ SOPs used to develop the Mississippi Benthic Index of Stream Quality (M-BISQ), and meet programmatic measurement quality objectives (MQO).

#### **Assessment Methodology:**

MDEQ developed the M-BISQ to provide the state with a sound scientific methodology for accurately monitoring and assessing the overall ecological condition of most of the state's Wadeable streams (streams in the Mississippi Alluvial Plain are not presently included) using benthic macroinvertebrates. The detailed assessment methodology based on M-BISQ for Aquatic Life Use Support and used for the 2014 §303(d) list is found in Appendix A.

### **Water Chemistry**

Only data for physical/chemical parameters for which Mississippi has adopted numeric water quality criteria in Mississippi's WQS will be used for making a water body §305(b) use support determination and/or a §303(d) listing. Other parameters for which numeric criteria have not been adopted (e.g., nutrients, turbidity/suspended solids, chlorophyll-a) will be shown as impairment causes if there is an identified association with exceedances of a parameter for which the state has a numeric criterion (e.g., elevated nutrients causing excursions of the dissolved oxygen criterion). Where data indicate only a slight variation from a criterion, the magnitude of the variation, as well as other site-specific natural influences (e.g., low pH in geographic regions with natural acidic soils and blackwater streams, extended drought conditions) will be taken into consideration. Professional judgment by MDEQ monitoring and data assessment staff will be incorporated into the use support determination process in these cases. Furthermore, no monitoring location will be assessed as not attaining water quality standards based on the results of a single chemical sample WQS violation. This is due to the possibility of an anomalous environmental event. In addition, no water body will be assessed as attaining ALUS using a set of water chemistry data that does not include dissolved oxygen (DO) data, a critical piece of environmental information for ALUS in the absence of biological community data.

## **Dissolved Oxygen (DO)**

Mississippi's DO criteria are based on daily arithmetic (i.e., 24-hour) averages and an instantaneous minimum as defined in the state's water quality standards. In Mississippi streams, the minimum DO concentration is generally observed during the environmentally critical condition, which is near sunrise in the summer/fall or low-flow, warm-weather index period. Consequently, 24-hour or diel monitoring, conducted manually or using automated in-situ dataloggers or sondes, is the preferred means of data collection for dissolved oxygen in order to make a meaningful assessment. MDEQ realizes that the majority of ambient monitoring DO data are often collected instantaneously in the late morning to the early afternoon hours, from 10:00 a.m. to 2:00 p.m. Therefore, in the absence of diel monitoring data, MDEQ will compare DO data to the instantaneous minimum criterion of 4.0 mg/L when the data requirements (as outlined below) are achieved.

### **DO Data Quantity:**

1. **Daily Average Measurements (diel monitoring):**
  - A. A minimum of 3 sampling events distributed over a 2-year period within the §305(b) data window collected during the environmentally critical condition generally occurring during the summer/fall index period from June through October.
  - B. A minimum of 24 consecutive hours of measurements per event. For events in excess of 24-hours, the time frame for the sampling event begins with the first quality-assured measurement taken after deployment of the data sonde.
  - C. Each 24-hour sampling event should at a minimum be spaced 1 week apart. With the use of in-situ dataloggers or sondes, a minimum sampling interval of 1 measurement per hour is required. If monitoring is conducted manually, 1 measurement every 4 hours is the required minimum sampling interval.
  - D. Measurements should include collection at the appropriate sample depth as specified for dissolved oxygen in 11 Miss. Admin. Code Pt. 6, R. 2.2, B of the state's WQS.
2. **Instantaneous Minimum:** Instantaneous measurements of DO will be considered for use support determinations as follows:
  - A. When data are collected during the environmentally critical condition generally occurring during a summer/fall index period from June through October, and meet the following data requirements:
    1. Minimum of 10 data points within an assessment window.
    2. Minimum of one-half (5 measurements) of the data are collected during the critical time of day (between 5:00 a.m. and 9:00 a.m.).
  - B. When data indicate a violation of instantaneous water quality criterion for DO at the non-critical condition (i.e., outside the summer/fall index period and time of day guidelines) and meet the following data requirements:
    1. More than 1 measurement is in violation of WQS.
    2. Measurements are spaced at least 1 week apart.
  - C. Measurements should include collection at the appropriate sample depth as specified for dissolved oxygen in 11 Miss. Admin. Code Pt. 6, R. 2.2, B of the state's WQS.

## **Assessment Methodology:**

**Daily Average:** When assessing diel dissolved oxygen data against the daily average criterion, assessments for dissolved oxygen will be made as follows:

**Not Attaining:**

A daily average of less than 5.0 mg/L is observed in more than 10% of the 24-hour sampling events, where 10% exceedance is determined using a binomial distribution test with 90% confidence ( $\alpha = 0.1$ ) where there are a minimum of 8 sampling events, described with the associated table in Appendix B. In order to use the binomial approach to determine 10% exceedance of the applicable criteria, a minimum of 8 sampling events is required. In situations where there are less than 8 diel sampling events, non-attainment will be indicated by a daily average of less than 5.0 mg/L in greater than 10% of the sampling events.

**Instantaneous:** In cases where only instantaneous DO data are collected during the critical condition, the instantaneous criterion of 4.0 mg/L will be used and assessments for dissolved oxygen will be made as follows:

**Not Attaining:**

Instantaneous criterion exceeded in more than 10% of the samples, where 10% exceedance is determined using a binomial distribution test ( $\alpha = 0.1$ ), described with the associated table in Appendix B. In addition, when an exceedance of the instantaneous criterion is observed during the non-critical time of day and a second exceedance is observed at a minimum of one week later, the monitoring location may be assessed as not attaining. The magnitude of the exceedance, as well as other site-specific natural influences (e.g., low DO in estuaries and naturally stratified waters), will be taken into consideration and professional judgment applied in making use support determinations.

Note: Where a site-specific criterion exists, that criterion will be used for assessment.

## **Conventional Chemical Data Other Than DO**

Some conventional parameters (e.g., temperature, pH, total dissolved solids, specific conductance, and chlorides) listed in the state's water quality standards do not have daily average criteria. These parameters may be measured instantaneously, but are often measured along with DO using automated equipment capable of recording diel measurements for extended periods of time. The assessment guidelines given below will be used for determining use support.

## **Data Quantity:**

### **1. Diel Measurements:**

- A. A minimum of 3 sampling events over a 2-year period within the §305(b) data window collected during the environmentally critical condition for the parameter of concern.
- B. A minimum of 24 consecutive hours of measurements per event. For events in excess of 24-hours, the time frame for the sampling event begins with the first quality-assured measurement taken after deployment.
- C. Each 24-hour sampling event should at a minimum be spaced 1 week apart. With the use of in-situ dataloggers or sondes, a minimum sampling interval of 1 measurement per hour is required. If monitoring is conducted manually, 1 measurement every 4 hours is the required minimum sampling interval.
- D. Measurements should include collection at the appropriate sample depth as specified for temperature in 11 Miss. Admin. Code Pt. 6, R. 2.2, E. of the state's WQS.

### **2. Instantaneous Measurements:**

- A. Minimum of 10 total data points within an assessment window.
- B. At least one-half of the data should represent the environmentally critical period for the parameter of concern.
- C. Measurements should include collection at the appropriate sample depth as specified for temperature in 11 Miss. Admin. Code Pt. 6, R. 2.2, E. of the state's WQS document.

## **Assessment Methodology:**

When assessing data for temperature, pH, TDS, specific conductance, and chlorides, use support will be assigned as follows:

### **Not Attaining:**

Instantaneous criterion exceeded in more than 10% of the samples, where 10% exceedance is determined using a binomial distribution test ( $\alpha = 0.1$ ), described with the associated table in Appendix B. In addition, the magnitude of the exceedance, as well as other site-specific natural influences (e.g., low pH in naturally acidic waters, high conductivity in tidally affected freshwater streams), will be taken into consideration and professional judgment applied in making use support determinations.

## **Toxicants (including Ammonia)**

During most routine ambient monitoring, water column toxicants are measured using screening level (i.e., "unclean") sampling and analytical techniques. These data will not be used to make use support determinations for §305(b) assessments or §303(d) decisions. However, these data will be reviewed as part of the §305(b) process. When concentrations above the state's water quality criteria are observed, follow-up sampling will be scheduled utilizing "clean" sampling and analytical procedures or techniques.

Data for toxicants will be assessed against acute criteria (i.e., one-hour average concentration) when single grab samples are taken using “clean” techniques. Data for toxicants collected in a manner suitable for a computation of an average 4-day chronic concentration (minimum of one sample every hour for four consecutive days) using “clean” techniques will be assessed against the chronic standard. Data for toxicants will be assessed when data requirements (as outlined below) are achieved.

**Data Quantity:**

1. Minimum of 10 data points within a three-year period within the §305(b) data window collected using clean techniques.

**Assessment Methodology:**

Assessments will be made as follows:

**Not Attaining:**

More than 10% exceedance of the toxic acute/chronic criteria, where 10% exceedance is determined using a binomial distribution test ( $\alpha = 0.1$ ), described with the associated table in Appendix B.

It should be noted that monitoring for most toxicants (i.e., metals and organics) is costly because “clean” techniques are required to derive accurate results. In these cases, data sets will likely never exceed 10 samples. Also, due to the costly nature of “clean” samples, it is normal protocol to suspend sampling efforts once 2 violations of appropriate WQS are observed.

## **RECREATION USE SUPPORT**

The recreation use is intended for the protection of waters suitable for recreational purposes including primary water contact activities such as swimming and water skiing as well as secondary incidental water contact activities such as wading, fishing, and boating. State waters classified for primary contact recreation status are specifically designated in the state’s WQS. Waters not specifically designated as such are considered secondary contact waters. Indicators appropriate for use in recreation use support determination include fecal coliform, enterococci, and *E. coli* bacteria. Enterococcus is the bacteriological indicator for assessment of coastal recreational waters including bathing beaches. Fecal coliform is the bacteriological indicator that the state has adopted to assess recreation use for inland waters.

## **Enterococci Bacteria (Marine Water)**

### **Data Quantity:**

1. A minimum of 4 sampling events distributed over a 2-year period within the §305(b) data window.
2. A sampling event consists of a minimum of 20 samples distributed over a 6 month sampling period with each sample spaced at least 12 hours apart.
3. In each year, a minimum of 1 sampling event will be taken in each of the contact and non-contact recreational seasons defined in the state's WQS.

### **Assessment Methodology:**

When assessing sites with more than two years of enterococci data, greater weight may be given to more recent sampling events during the data window. Assessments for Primary Contact Recreation or Secondary Contact Recreation will be assigned as follows:

#### **Not Attaining:**

If the geometric mean criterion for the water's applicable recreation classification as given in the state's water quality standards is exceeded in greater than 10% of the 6-month sampling events (based on a minimum of 20 samples per event), where 10% exceedance is determined using a binomial distribution test ( $\alpha = 0.1$ ), described with the associated table in Appendix B. In order to use the binomial approach to determine 10% exceedance of the applicable criteria, a minimum of 8 sampling events is required. In situations where there is less than 8 sampling events, non-attainment will be indicated where the criterion is exceeded in greater than 25% of the sampling events.

## **Fecal Coliform Bacteria (Fresh Water)**

### **Data Quantity:**

1. A minimum of 4 sampling events distributed over a 2-year period within the §305(b) data window.
2. A sampling event consists of a minimum of 5 samples distributed over a 30-day sampling period with each sample spaced at least 12 hours apart.
3. In each year, a minimum of 1 sampling event will be taken in each of the contact and non-contact recreational seasons defined in the state's WQS.

### **Assessment Methodology:**

When assessing sites with more than two years of fecal coliform data, greater weight may be given to more recent sampling events during the 5-year data window. Assessments for Primary Contact Recreation or Secondary Contact Recreation will be assigned as follows:

**Not Attaining:**

If the geometric mean criterion for the water's applicable recreation classification as given in the state's water quality standards is exceeded in greater than 10% of the 30-day sampling events; or, if monitoring data indicate that the instantaneous criterion for fecal coliform is exceeded in more than 10% of the 30-day sampling events (based on a minimum of 5 samples), where 10% exceedance is determined using a binomial distribution test ( $\alpha = 0.1$ ), described with the associated table in Appendix B. In order to use the binomial approach to determine 10% exceedance of the applicable criteria, a minimum of 8 sampling events is required. In situations where there is less than 8 sampling events, non-attainment will be indicated where the criterion is exceeded in greater than 25% of the sampling events.

## **FISH CONSUMPTION USE SUPPORT**

The fish consumption designated use is intended to provide for the protection of human health from fish tissue obtained for human consumption. Indicators appropriate for fish consumption use support determinations include the actual levels of bioaccumulative chemicals in fish tissue.

For the 2014 §305(b), the only assessment rendered will be that for non-attainment of the fish consumption use. This assessment will be based on the existence of a fish consumption advisory that is supported by water body specific fish tissue monitoring. These advisories are issued by MDEQ and the Mississippi Department of Health after consultation with the Mississippi Fish Advisory Task Force made up of representatives from several state agencies. Water bodies that have fish consumption advisories (i.e., restricted or no consumption advisories), based on actual data for the specific water body, will be assessed as not attaining the Fish Consumption Use Support designation.

## **SHELLFISH CONSUMPTION USE SUPPORT**

The shellfish consumption designated use is applicable to coastal estuarine waters in Mississippi specifically identified for shellfish harvesting in the state's WQS. This use is intended to provide for the safe propagation and harvesting of shellfish for human consumption. The National Shellfish Sanitation Program (NSSP) determines these classifications. The Mississippi Department of Marine Resources administers this program for Mississippi coastal waters. Indicators appropriate for shellfish consumption use support determinations include the actual levels of pollutants in shellfish tissue and ambient waters.

Attainment of the Shellfish Harvesting Use is primarily assessed based on the Shellfish Classification system as defined under the NSSP and is supported by actual bacteria (fecal coliform) data for the water bodies being assessed. Waters classified as approved or conditionally approved and open at least 75% of the season, will be assessed as

attaining the shellfish consumption use. Waters classified as restricted or prohibited will be assessed as non-attaining. However, if a water body classified for shellfishing is restricted and/or prohibited solely because of its geographic location (i.e., proximity to a shoreline or a permitted NPDES wastewater discharge point) and no data are available, the water body will not be assessed. Currently, MDEQ has developed TMDLs for all waters classified for the Shellfish Harvesting Use.

## **DRINKING WATER SUPPLY USE**

The drinking water supply designated use is applicable to surface waters in Mississippi specifically identified under the Public Water Supply classification in the state's WQS. This use is intended to provide for a safe source of raw water supply for drinking and food processing purposes. Indicators appropriate for use in drinking water supply use determination include chemical data. Chemical parameters as specifically denoted in the state's WQS document will be utilized for assessment. Data quantity and assessment methodology will follow the same requirements as for those parameters identified under **Conventional Chemical Data Other Than DO**.

### **Datasets Not Meeting Minimum Quantity/Quality Requirements:**

All data and information collection activities may not meet the quality, quantity, and sampling frequency requirements described in this document. Nevertheless, these data and information collection activities have value in assessing water quality and MDEQ will consider these data in the §305(b) assessment process. Datasets of this type are screened using a determination of percent exceedances of water quality thresholds and WQS using the same process established for data that meet CALM requirements. This is followed by a case-by-case review and use of professional judgment to determine if the limited datasets adequately represent existing water quality conditions.

These limited datasets and information that do not meet the CALM requirements stated in this methodology will only be used for a §303(d) listing decision when the following conditions are met:

1. Those data demonstrate compelling evidence (CE) of the water quality and,
2. The data are supported by data quality documentation and MDEQ determines that the data is scientifically defensible after conducting a review of the quality assurance procedures used by the data generator.

Monitoring sites identified as potentially impaired or potentially supporting but with less evidence and/or a lack of data quality documentation are considered insufficient data for §305(b) assessment and §303(d) listing. However, these data are not dismissed. In order to confirm the water quality condition, the water body is assigned to a monitoring or watch list where it can be scheduled for future monitoring by MDEQ through its Surface Water Monitoring Strategy implementation.

## APPENDIX A

### **Mississippi Benthic Index of Stream Quality (M-BISQ) Assessment Methodology for Aquatic Life Use Support (ALUS)**

#### **Background**

For a detailed discussion of the M-BISQ development effort see [Development and Application of the Mississippi Benthic Index of Stream Quality \(M-BISQ\)](#) (MDEQ, 2003) and [Evaluation and Recalibration of the Mississippi Benthic Index of Stream Quality \(MBISQ\)](#), (MDEQ, 2008). For the 2014 assessment, M-BISQ scores determined from biological samples collected from 2008-2012 will be used to make ALUS assessments. M-BISQ scores for biological data collected within the assessment window will be compared to bioregions and metrics as determined by the recalibration of the M-BISQ. The assessment threshold for each calibration set remains the 25<sup>th</sup> percentile of the least disturbed sites for the appropriate bioregion.

Least Disturbed Condition (i.e., "reference"):

The "least disturbed" sites within each bioregion are considered as a comparison set for that bioregion. The numeric M-BISQ scores for each bioregion's comparison set make up a distribution from which a statistical reference point reflects the concept of "least disturbed" or "best attainable" conditions. The 25<sup>th</sup> percentile of the M-BISQ score distribution for each bioregional comparison set (Figure 1) is used as the reference point or threshold of attainment. The 25<sup>th</sup> percentile is considered to approximate the desired reference condition and thus serves as a threshold of attainment of ALUS. This threshold of ALUS attainment for each bioregion is used for comparing biological data collected from Wadeable streams in each respective bioregion. It is also considered to capture and reflect the inherent certainty, and uncertainty, of the measurement process. To allow for comparison to the ALUS attainment threshold, the biological data from each Wadeable site sampled are combined to calculate the final multi-metric index score (M-BISQ) for each site. The relationship of the final score to the attainment threshold of the appropriate bioregion determines the assessment status for the site. A detailed explanation of the 2014 §305(b) listing process is given below in the Assessment Guidelines Section.

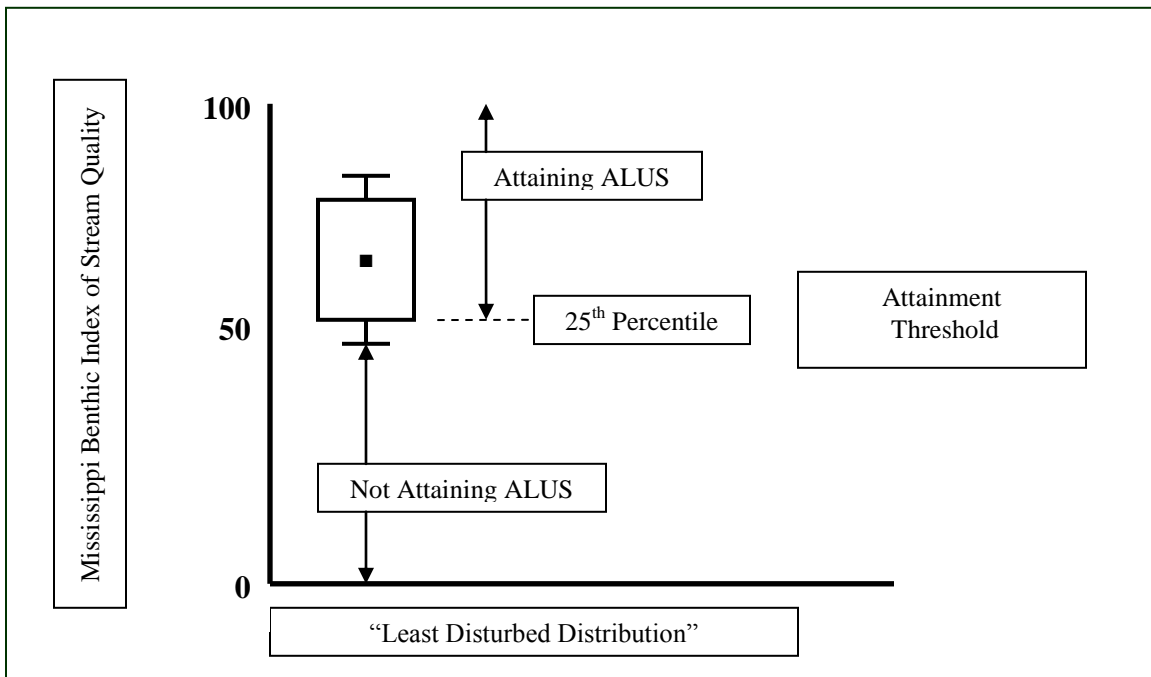


Figure 1. Sample M-BISQ Score Distribution for a Bioregional Comparison Set

### **M-BISQ Assessment Guidelines for the 2014 §305(b) Assessment Process**

1. Streams with initial (first time monitored) M-BISQ site scores at or above the attainment threshold (25th percentile) score of the comparison set, for their respective bioregion, will be considered as ***attaining*** ALUS.
2. Streams with initial (first time monitored) M-BISQ site scores below the minimum score of the comparison set, for their respective bioregion, will be considered ***not attaining*** ALUS caused by biological impairment.
3. For streams having two or more M-BISQ scores, each score will be taken into account when making water quality assessment and listing decisions. Before using multiple IBI scores from a given site, the following conditions will be considered:
  - Each M-BISQ score was developed according to M-BISQ methodology and is QA-approved,
  - Each M-BISQ score was obtained within the applicable data window for the §305(b) reporting period,
  - Environmental conditions (climatic and flow) were considered representative of the site for both M-BISQ sampling events.

When these conditions are met and scores are within 20 points of each other, the two scores will be averaged. Only scores developed within the same calibration dataset will be averaged. Based on this average score, the site will be assessed as follows:

- If the average score falls below the 25<sup>th</sup> percentile of the comparison set, the site will be assessed as ***not attaining*** ALUS with the assessment cause of biological impairment.
  - If the average score falls at or above the 25<sup>th</sup> percentile of the comparison set, the site will be assessed as ***attaining*** ALUS.
4. If the individual M-BISQ scores of the sampling events at the same sampling location are substantially different (> 20 points), the difference will be investigated. The significant difference in scores may indicate that site conditions changed or that one of the scores may not be representative of the ambient condition (i.e. an anomalous event). In these cases, additional data review for the two sampling events will be performed to evaluate possible reasons that account for the large variability and to determine which, if either, of the two scores is more representative of current water quality conditions at the site. Based on this evaluation, the following conditions will apply in using these scores for assessments:
- If the reason for the discrepancy in scores cannot be determined, the most recent score will be used and assessments made by using the 25<sup>th</sup> percentile of the comparison set.
  - If the reason for the discrepancy in scores is determined, the score most representative of current site specific water quality conditions will be used and assessments made using the 25<sup>th</sup> percentile of the comparison set.

## APPENDIX B

### Use of the Binomial Test for Evaluating 10% Exceedance:

The sample proportion of exceedance of the criterion for a specific pollutant is an estimate of the true exceedance probability of that pollutant. Given the random variability in estimating a true exceedance probability, as for the estimate of any parameter, there is uncertainty in the estimated sample proportion of exceedance. The degree of this uncertainty is a function of sample size and the number of exceedances. The fewer samples taken, the more uncertainty there is in the sample estimate of the true exceedance probability. MDEQ has chosen to consider this uncertainty when making determinations with regards to evaluating the sample proportion of exceedances of criteria. MDEQ will use a nonparametric hypothesis testing approach based on the binomial distribution.

A pollutant concentration can be converted into a simple binomial where a single observation either exceeds (1) or does not exceed (0) a criterion. The actual distribution is unknown, but by using the number of measured exceedances and the total number of samples, the unknown distribution can be converted into a binomial distribution that depends only on the sample size and the true exceedance probability ( $p$ ). One can then use a simple hypothesis test about the sample, with the target exceedance (e.g., 10%) used as the true exceedance probability to test the hypothesis of “whether the sample exceedance probability is significantly larger than the assumed target exceedance probability”. The null hypothesis ( $H_0$ ) in such a case is that the sample exceedance probability ( $p$ ) is less than or equal to the target (e.g., 10% or 0.1):

$$H_0: p \leq 0.1,$$

and the water body is unimpaired, versus the alternative ( $H_a$ ):

$$H_a: p > 0.1,$$

and the waterbody is impaired.

This test is performed by comparing the observed percent exceedances ( $x$ ) to a binomial probability table. For example, for sample size of 10 ( $N$ ), the probability of observing 2 or less exceedances in a population with a true exceedance probability of 10% or less ( $p = 0.1$ ) is 0.9298 and of observing 3 or more is 0.0702. That is, one is pretty confident (93%) that a sample of 10 observations will have 2 or less exceedances observed. Note that this is true even though the observed percent exceedance is 20% (2/10). A 20% exceedance percentage is not significantly larger than the assumed 10% exceedance probability at 7% level of significance (93% confidence). Therefore, to be 95% confident in rejecting the null hypothesis, one would need to observe more than 2 exceedances in a sample of 10. However, for the same test, to be 90% confident in rejecting the null hypothesis, one would conclude that more than 1 exceedance in a sample of 10 would constitute a 10% exceedance, since 93% exceeds 90%. The decision about confidence is a policy decision that must weigh the risks of type I error (falsely rejecting the null

hypothesis) against the type II error (falsely accepting the null hypothesis). Small sample sizes can carry a significant risk of committing type II errors.

Using many software packages, one can quickly calculate the number of exceedances needed to list an impaired waterbody as exceeding any target frequency of exceedance for any confidence level. The Microsoft Excel function  $\text{CRITBINOM}(N, p, 1-\alpha)$  can be used to estimate the maximum number of exceedances ( $x$ ) out of  $N$  observations or trials that meets the target probability ( $p$ ) for a specific type I error rate ( $\alpha$ ) or confidence level ( $1-\alpha$ ). This function, therefore, provides the critical value for testing the null hypothesis above at a  $(100\alpha)\%$  level of significance, where  $p$  and  $\alpha$  are selected by MDEQ. The number of exceedances that is one greater than this value represents, therefore, the minimum number of exceedances that violate the exceedance probability. Table B-1 lists these exceedance values for  $\alpha = 0.1$  for  $p = 10\%$  exceedance probability. These critical values (the number of exceedances that indicate greater than 10% exceedance with 90% confidence) will be used to assess against the 10% exceedance frequencies as described in the CALM process listed above for different sample sizes. Critical values for sample sizes above those listed here will be calculated using the  $\text{CRITBINOM}$  function listed above in Microsoft Excel. In order to use the binomial approach to determine 10% exceedance of the applicable criteria, a minimum of 8 sampling events is required.

Table B-1 provides the number of exceedances (x) for a given sample size (N) where one can conclude with 90% confidence ( $\alpha = 0.1$ ) that percent exceedances is significantly greater than  $p = 0.1$  (10%).

N	x	N	x	N	x	N	x	N	x
1	2	41	8	81	13	121	17	161	22
2	2	42	8	82	13	122	18	162	22
3	2	43	8	83	13	123	18	163	22
4	2	44	8	84	13	124	18	164	22
5	2	45	8	85	13	125	18	165	23
6	3	46	8	86	13	126	18	166	23
7	3	47	8	87	13	127	18	167	23
8	3	48	9	88	13	128	18	168	23
9	3	49	9	89	14	129	18	169	23
10	3	50	9	90	14	130	18	170	23
11	3	51	9	91	14	131	19	171	23
12	4	52	9	92	14	132	19	172	23
13	4	53	9	93	14	133	19	173	23
14	4	54	9	94	14	134	19	174	24
15	4	55	9	95	14	135	19	175	24
16	4	56	10	96	14	136	19	176	24
17	4	57	10	97	15	137	19	177	24
18	4	58	10	98	15	138	19	178	24
19	5	59	10	99	15	139	20	179	24
20	5	60	10	100	15	140	20	180	24
21	5	61	10	101	15	141	20	181	24
22	5	62	10	102	15	142	20	182	24
23	5	63	10	103	15	143	20	183	25
24	5	64	11	104	15	144	20	184	25
25	5	65	11	105	16	145	20	185	25
26	6	66	11	106	16	146	20	186	25
27	6	67	11	107	16	147	20	187	25
28	6	68	11	108	16	148	21	188	25
29	6	69	11	109	16	149	21	189	25
30	6	70	11	110	16	150	21	190	25
31	6	71	11	111	16	151	21	191	25
32	6	72	12	112	16	152	21	192	26
33	7	73	12	113	16	153	21	193	26
34	7	74	12	114	17	154	21	194	26
35	7	75	12	115	17	155	21	195	26
36	7	76	12	116	17	156	21	196	26
37	7	77	12	117	17	157	22	197	26
38	7	78	12	118	17	158	22	198	26
39	7	79	12	119	17	159	22	199	26
40	7	80	13	120	17	160	22	200	27

## **APPENDIX C**

### **11 Miss. Admin. Code Pt. 6, Ch. 2**

#### **Mississippi Commission on Environmental Quality Regulations for Water Quality Criteria for Intrastate, Interstate, And Coastal Waters**

## **Administrative Procedures Act Rules**

### **Title 11: Mississippi Department of Environmental Quality**

#### **Part 6: Wastewater Pollution Control Regulations**

#### **Part 6, Chapter 2: Mississippi Commission on Environmental Quality Regulations for Water Quality Criteria For Intrastate, Interstate, And Coastal Waters**

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#### *Rule 2.1 General Conditions:*

A. Antidegradation: The policy inherent in the standards shall be to protect water quality existing at the time these water quality standards were adopted and to upgrade or enhance water quality within the State of Mississippi. Waters whose existing quality is better than the established standards will be maintained at high quality unless the Commission finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the State's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In no event, however, may degradation of water quality interfere with or become injurious to existing instream water uses. Further, in no case will water quality be degraded below (or above) the base levels set forth in these standards for the protection of the beneficial uses described herein. In addition, the State will assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control. Where the Commission determines that high quality waters constitute an outstanding National resource, such as waters of National State Parks, Wildlife Refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected. For the purposes of this rule, existing uses are defined as those uses actually attained in the water body on or after November 28, 1975, whether or not they are included in the Water Quality Criteria.

B. Sampling and Assessment: The limiting values of water quality herein described shall be measured by the Commission in waters under consideration as determined by good environmental engineering and scientific practice and after consultation with affected parties. Samples shall be taken from points so distributed over the seasons of the year, time of day, and area and depth of the waters being studied as to permit a realistic assessment of water

quality. All sampling must be conducted in accordance with the MDEQ-approved Quality Management Plan (QMP), Quality Assurance Project Plan (QAPP), or its equivalent.

Samples shall be analyzed in accordance with methodology specified in 40 CFR 136 and with the latest edition of *Standard Methods for the Examination of Water and Wastewater* or other methods acceptable to the Commission.

C. Designated Use Attainability: Certain waters of the State may not fall within desired or prescribed limitations as outlined. In such instances the Commission may authorize exceptions to these limits, under the following conditions:

- (1) the designated use is not attainable because of natural background conditions; or
- (2) the designated use is not attainable because of irretrievable man-induced conditions; or
- (3) the application of effluent limitations for existing point sources is more stringent than those required pursuant to Section 301(b)(2)(A) and (B) of the Federal Water Pollution Control Act of 1972, as amended, in order to attain the designated use, would result in substantial and widespread adverse economic and social impact.

In no case shall it be permissible to deposit or introduce materials into waters of the State that will cause impairment of the reasonable or legitimate use of said waters.

D. Natural Conditions: Natural conditions are defined as background water quality conditions due only to non-anthropogenic sources. The criteria herein apply specifically with regard to substances attributed to sources (discharges, nonpoint sources, or instream activities) as opposed to natural phenomena. Waters may naturally have characteristics outside the limits established by these criteria. Therefore, naturally occurring conditions that fail to meet criteria should not be interpreted as violations of these criteria.

E. Criteria: In view of the fact that industry is continuing to produce new materials whose characteristics and effects are unknown at this time or for which incomplete national criteria have been established, for the purposes of setting water quality standards or permit limits on a case-by-case basis, such materials shall be evaluated on their merits as information becomes available to the Commission. Sources of information shall include, but not be limited to, the latest edition of *Quality Criteria for Water*, prepared by the Environmental Protection Agency pursuant to Section 304(a) of the Federal Clean Water Act.

F. Applicable Flow: All criteria contained herein shall apply to all stages of stream flow greater than or equal to the 7-day, 10-year minimum flow (7Q10) in unregulated, natural streams, and the legally guaranteed minimum flow in regulated streams, unless otherwise provided in these regulations. This requirement shall not be interpreted to permit any unusual waste discharges during periods of lower flow. Notwithstanding the above, a stream flow equal to the 7-day, 2-year minimum flow (7Q2) in unregulated natural streams shall be utilized in establishing permit limitations for storm water permits. In cases in which either (1) the data are

indefinite or inconclusive, or (2) the 7-day, 2-year minimum flow and/or the 7-day, 10-year minimum flow are inappropriate because of the hydrology of the area, other appropriate State and federal agencies will be consulted in establishing the applicable stream flow.

G. Mississippi River: The Mississippi River is classified for Fish and Wildlife, but with the following additions to the criteria stated herein:

Mineral Constituents: Not to exceed the following concentrations at any time:

From Mississippi-Tennessee border to Vicksburg

Chlorides	60 mg/l
Sulfates	150 mg/l
TDS	425 mg/l

From Vicksburg south to the Mississippi-Louisiana border

Chlorides	75 mg/l
Sulfates	120 mg/l
TDS	400 mg/l

H. Mixing Zones: It is recognized that limited areas of mixing are sometimes unavoidable; however, mixing zones shall not be used as a substitute for waste treatment. Mixing zones constitute an area whereby physical mixing of a wastewater effluent with a receiving water body occurs. Application of mixing zones shall be made on a case-by-case basis and shall only occur in cases involving large surface water bodies in which a long distance or large area is required for the wastewater to completely mix with the receiving water body.

The location of a mixing zone shall not significantly alter the designated uses of the receiving water outside its established boundary. Adequate zones of passage for the migration and free movement of fish and other aquatic biota shall be maintained. Toxicity and human health concerns within the mixing zone shall be addressed as specified in the *Environmental Protection Agency Technical Support Document* for Water Quality-Based Toxics Control (EPA-505/2-90-001, March 1991) and amendments thereof. Under no circumstances shall mixing zones overlap or cover tributaries, nursery locations, locations of threatened or endangered species, or other ecologically sensitive areas.

I. Coastal Recreational Waters: Coastal Recreational Waters are marine and estuarine waters that are suitable for recreational purposes, including such water contact activities as swimming, wading, and water skiing. Coastal recreational waters do not include inland waters upstream of the mouth of a river or a stream having a natural connection to the open sea. Water quality monitoring for bacteria content is conducted on these waters to protect the health of bathers. Water contact is discouraged on Mississippi's public access bathing beaches along the shoreline of Jackson, Harrison, and Hancock Counties when enterococci exceed 104 colonies per 100 ml and in all other coastal recreational waters when enterococci exceed 501 colonies per 100 ml. When enterococci counts exceed 104 per 100 ml at the public access beaches, water contact advisories are issued by Mississippi's Beach Monitoring Task Force.

J. Definitions:

- (1) Acute criterion or Criteria Maximum Concentration (CMC) is the highest concentration of a pollutant to which aquatic life can be exposed for a short period of time (1-hour average) without deleterious effects. (40 CFR 131.36)
- (2) Best management practice (BMP) means a structural or nonstructural management-based practice used singularly or in combination to reduce nonpoint source inputs to receiving waters in order to achieve water quality protection goals.
- (3) Bioconcentration Factor (BCF) is defined as the ratio (in L/kg-tissue) of the concentration of a substance in tissue of an aquatic organism to its concentration in the ambient water, in situations where the organism is exposed through the water only and the ratio does not change substantially over time. (EPA-822-B-00-004)
- (4) Biological integrity is defined as the ability of a system to support and maintain a balanced, integrated, and adaptive community of organisms having a composition, diversity, and functional organization comparable to that of natural habitats of the region.
- (5) Cancer Potency Factor (CPF) is a measure of the cancer-causing potency of a substance estimated by the upper 95 percent confidence limit of the slope of a straight line calculated by the Linearized Multistage Model according to the U.S. Environmental Protection Agency Guidelines (FR 51(185): 339992-34003, and FR 45(231 Part V); 79318-79379).
- (6) Chronic Criterion or Criteria Continuous Concentration (CCC) is the highest concentration of a pollutant to which aquatic life can be exposed for an extended period of time (4 days) without deleterious effects. (40 CFR 131.36)
- (7) Clean techniques refers to an integrated system of sample collection and laboratory analytical procedures designed to detect concentrations of trace metals below criteria levels and eliminate or minimize inadvertent sample contamination that can occur during traditional sampling practices.
- (8) Composite sampling is a technique whereby multiple temporally or spatially discrete media or tissue samples are combined, thoroughly homogenized, and treated as a single sample.
- (9) Grab samples are samples where the entire sample is collected in one uninterrupted interval.

- (10) Mean Annual Flow is the total of daily mean flows for the full period of record divided by the total days for the full period of record.
- (11) Membrane Filtration (MF) is a method of quantitative or qualitative analysis of bacterial or particulate matter in a water sample filtered through a membrane capable of retaining bacteria.
- (12) Most probable number (MPN) is the most probable number of coliform-group organisms per unit volume of sample water.
- (13) Point source is a stationary location or fixed facility from which pollutants are discharged or emitted. Also, any single identifiable source of pollution, e.g., a pipe, ditch, or ship.
- (14) 7Q10 is the average streamflow rate over seven consecutive days that may be expected to be reached as an annual minimum no more frequently than one year in ten years.
- (15) 7Q2 is the average streamflow rate over seven consecutive days that may be expected to be reached as an annual minimum no more frequently than one year in two years.
- (16) Stratification is the formation of layers of water within a water body that are of different densities. The density difference may be caused by variations of temperature, salinity, or concentrations of other dissolved substances within the water at different depths.
- (17) Threshold odor number is the number of times a sample needs to be diluted with clean water in order to reach the level that smell is not detectable.
- (18) Toxic substance means any substance or combination of substances (including disease-causing agents), which after discharge and upon exposure, ingestion, inhalation, or assimilation into any organism, whether directly from the environment or indirectly by ingestion through food chains, has the potential to cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions or suppression in reproduction or growth) or physical deformities in such organisms or their offspring.

Source: Miss. Code Ann. §§ 49-2-1, *et seq.* and 49-17-1, *et seq.*

*Rule 2.2 Minimum Conditions Applicable to All Waters:*

A. Narrative Standards

- (1) Waters shall be free from substances attributable to municipal, industrial, agricultural, or other discharges that will settle to form putrescent or otherwise objectionable sludge deposits.
- (2) Waters shall be free from floating debris, oil, scum, and other floating materials attributable to municipal, industrial, agricultural, or other discharges in amounts sufficient to be unsightly or deleterious.
- (3) 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. Except as prohibited in Rule 2.1.H. above, the turbidity outside the limits of a 750-foot mixing zone shall not exceed the background turbidity at the time of discharge by more than 50 Nephelometric Turbidity Units (NTU). Exemptions to the turbidity standard may be granted under the following circumstances:
  - (a) in cases of emergency to protect the public health and welfare
  - (b) for environmental restoration projects which will result in reasonable and temporary deviations and which have been reviewed and approved by the Department of Environmental Quality.
- (4) Waters shall be free from substances attributable to municipal, industrial, agricultural, or other discharges in concentrations or combinations that are toxic or harmful to humans, animals, or aquatic life. Specific requirements for toxicity are found in Rule 2.2.F.
- (5) Municipal wastes, industrial wastes, or other wastes shall receive effective treatment or control in accordance with Section 301, 306, and 307 of the Federal Clean Water Act. A degree of treatment greater than defined in these sections may be required when necessary to protect legitimate water uses.

B. Water Body Classifications and Designated Uses: The State of Mississippi water body classifications and corresponding U.S. EPA associated designated uses for water quality assessment purposes recognized by the State of Mississippi are as follows:

**Table 1. Mississippi Water Body Classifications and Designated Uses**

<b>MS Water Body Classification</b>	<b>U.S. EPA Associated Designated Use</b>
Public Water Supply	Drinking Water Supply
Recreation	Primary Contact Recreation

Shellfish Harvesting	Shellfish Consumption
Fish and Wildlife	Aquatic Life Use Fish Consumption Secondary Contact Recreation

A water body classified as Public Water Supply, Recreation, or Shellfish Harvesting shall meet not only the criteria to support its respective classification, but also shall meet the criteria to support the Fish and Wildlife classification.

C. Dissolved Oxygen: Dissolved oxygen concentrations shall be maintained at a daily average of not less than 5.0 mg/l with an instantaneous minimum of not less than 4.0 mg/l.

When possible, samples should be taken from ambient sites according to the following guidelines:

For waters bodies that are not stratified, samples should be taken:

At mid-depth if the total water column depth is 10 feet or less.

At 5 feet from the water surface if the total water column depth is greater than 10 feet.

For waters that are stratified, samples should be taken:

At mid-depth of the epilimnion if the epilimnion depth is 10 feet or less.

At 5 feet from the water surface if the epilimnion depth is greater than 10 feet.

D. pH: The normal pH of the waters shall be 6.0 to 9.0 and shall not be caused to vary more than 1.0 unit within this range. Variations may be allowed on a case-by-case basis if the Commission determines that there will be no detrimental effect on the water body's designated uses as a result of the greater pH change. In black water streams and in those watersheds with highly acidic soils, the pH may be lower than 6.0 due to natural conditions.

E. Temperature: The maximum water temperature increase above natural temperatures shall not exceed 5°F (2.8°C) in streams, lakes, and reservoirs nor shall the maximum water temperature exceed 90°F (32.2°C), except that in the Tennessee River the temperature shall not exceed 86°F (30°C). In lakes and reservoirs, there shall be no withdrawals from or discharge of heated waters to the hypolimnion unless it can be shown that such discharge will be beneficial to water quality.

In all waters the normal daily and seasonal temperature variations that were present before the addition of artificial heat shall be maintained. The maximum water temperature shall not exceed 90°F (32.2°C) in coastal or estuarine waters. The discharge of any heated waste into any coastal or estuarine waters shall not raise temperatures more than 4°F (2.2°C) above natural background

temperatures during the months of October through May nor more than 1.5°F (0.8°C) above natural background temperature during the months of June through September.

There shall be no thermal block to the migration of aquatic organisms. Requirements for zones of passage as referenced in Rule 2.1.H. shall apply. The general requirements of Rule 2.1.B. state that samples should be taken from points so distributed over the seasons of the year, time of day, and area and depth of the waters being studied as to permit a realistic assessment of water quality. Therefore, the temperature shall be measured during the environmentally critical period. In addition, temperature shall be measured at a depth of 5 feet in waters 10 feet or greater in depth; and for those waters less than 10 feet in depth, temperature criteria will be applied at mid-depth.

In those specific cases where natural conditions elevate the temperatures in excess of the limits expressed herein, Rule 2.2.E. shall apply on a case-by-case basis. The discharge of any heated waters into a stream, lake, or reservoir shall not raise temperatures more than 5°F(2.8°C) above natural condition temperatures. The discharge of any heated waste into any coastal or estuarine waters shall not raise temperatures more than 4°F (2.2°C) above natural condition temperatures during the months of October through May nor more than 1.5°F (0.8°C) above natural condition temperatures during the months of June through September. This will also be considered on a case-by-case basis requiring evidence that the aquatic life of the water body will not be adversely impacted by the elevated temperatures.

F. Toxic Substances:

(1) Aquatic Life and Human Health Standards

- (a) Aquatic Life - The concentration of toxic substances in State waters shall not result in chronic or acute toxicity or impairment of the uses of aquatic life. Toxicity concentrations in State waters in excess of these values shown in Table 2 will be assessed to determine chronic or acute toxicity, and/or the impairment of the uses of aquatic life. Chronic and/or acute toxicity will be determined in accordance with the *Water Quality Standards Handbook: Second Edition* (EPA-823-B-94-005a, August 1994) and *Technical Support Document for Water Quality-Based Toxics Control* (EPA-505/2-90-001, March 1991). Regardless of the results of chronic or acute toxicity bioassay surveys, the concentrations of toxic substances shall not exceed the chronic or acute values, except as provided for in Rules 2.2.F.5(a) and 2.2.F.5(b).
- (b) Human Health - The concentration of toxic substances shall not exceed the level necessary to protect human health through exposure routes of fish (and shellfish) tissue consumption, water consumption, or other routes identified as appropriate for the water body.

- (2) Numeric criteria for all waters are established herein for certain toxic pollutants for which the Environmental Protection Agency (EPA) has published national criteria for the protection of aquatic life and human health pursuant to Section 304(a) of the Federal Clean Water Act in addition to chlorine and ammonia. The pollutants are listed in Table 2 and are expressed as the dissolved phase of the parameter.
- (3) Ammonia toxicity shall be evaluated according to EPA guidelines published in *1999 Update of Ambient Water Quality Criteria for Ammonia; EPA document number EPA-822-R-99-014 or Ambient Water Quality Criteria for Ammonia (Saltwater) - 1989; EPA document number 440/5-88-004*. This material related to ammonia toxicity is hereby incorporated by reference including any subsequent amendments and editions.
- (4) Application of Numerical Criteria:
  - (a) When evaluating human health effects all waters must comply with the Organisms Only criteria except for waters classified as Public Water Supply and all stream segments within 50 stream miles upstream of a drinking water intake. Stream segments that are classified as Public Water Supply or are within 50 miles upstream of a drinking water intake shall comply with the Water and Organisms criteria.
  - (b) When applying acute or chronic toxicity or human health criteria the following stream flows shall be used:
 

Acute Toxicity - 7Q10  
Chronic Toxicity - 7Q10  
Human Health - Mean Annual Flow
  - (c) Criteria for certain metals may be modified on a site-specific basis when a water effect ratio (WER) is conducted in accordance with Rule 2.6.C.2.a. of 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*, Title 11, Part 6, Chapter 1. In these instances, the criterion for the specific metal in the affected water body shall be equal to the criterion concentrations calculated using the following equations:

$\text{CMC} = \text{WER} * \text{Acute and } \text{CCC} = \text{WER} * \text{Chronic}$
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Where: CC = Criteria Continuous Concentration  
 CMC = Criteria Maximum Concentration  
 WER = Water Effects Ratio for a Specific Pollutant  
 Acute = Acute Criterion from Table 2

Chronic = Chronic Criterion from Table 2

When a WER has not been conducted, the criterion listed in Table 2 of this regulation shall apply because the value of the WER is presumed to equal one in the absence of data to indicate otherwise.

(5) Discharge Specific Criteria:

(a) Existing Discharges

(1) The Commission may establish discharger specific alternative criteria for existing discharges if all of the following conditions are satisfied:

(i) Discharge existed prior to December 1, 1988.

(ii) Discharger performs acute and/or chronic bioassays and instream biological assessments and other evaluations as deemed appropriate by the Commission.

(iii) The designated use of the waters is maintained.

(2) All discharger specific alternative criteria will be subject to Mississippi public participation requirements for revisions to water quality standards and will be subject to review by the U. S. Environmental Protection Agency.

(b) New Source Discharges

(1) The Commission may establish discharger specific criteria for new source discharges if the discharger can demonstrate that established Water Quality Criteria are based on conditions not applicable to Mississippi such as, but not limited to, the use of species not indigenous to Mississippi.

(2) All discharger specific alternative criteria will be subject to Mississippi public participation requirements for revisions to water quality standards and will be subject to review by the U. S. Environmental Protection Agency.

(6) Toxic and Human Health Parameters for which no Numeric Criteria have been Established:

(a) For those toxic and human health parameters for which no numeric criteria have been established, the Commission shall determine limitations using available references which shall include, but not be limited to, *Quality*

*Criteria for Water* (Section 304(a)), Federal regulations under Section 307 of the Clean Water Act, and Federal regulations under Section 1412 of the Public Health Service Act as amended by the Safe Drinking Act (Pub. 93-523).

- (b) The not to be exceeded value for criteria published in 1980 or the one hour average value for criteria published in 1985 or later shall be used as an acute toxicity number for calculating effluent limitations, establishing Total Maximum Daily Loads (TMDLs), or reviewing ambient water quality data.
- (c) The 24-hour average for criteria published in 1980 or the 4-day average for criteria published in 1985 or later shall be used as a chronic toxicity number for calculating effluent limitations, establishing TMDLs, or reviewing ambient water quality data.
- (d) If metals concentrations for criteria are hardness-dependent, the chronic and acute concentrations shall be based on 25 mg/l hardness if the ambient hardness is less than or equal to 25 mg/l. Concentrations shall be based on the actual mixed stream hardness.
- (e) If separate criteria are given for fresh and salt waters, they shall be applied as appropriate.
- (f) For non-carcinogens, these concentrations will be determined using a Reference Dose (RfD) as published by the U. S. Environmental Protection Agency pursuant to Section 304(a) of the Federal Water Pollution Act as amended unless a more recent RfD is issued by the U. S. Environmental Protection Agency as listed in the Integrated Risk Information System (IRIS) file, in which case the more recent value will be used. Water quality standards or criteria used to calculate water quality-based effluent limitations (and for all other purposes of water quality criteria under Section 303(c) of the Clean Water Act) to protect human health through the different exposure routes are determined as follows:

- (1) Fish tissue consumption:

$$WQC = (RfD) \times \text{Body Weight} / (FCR \times BCF)$$

where: WQC = water quality criterion

RfD = reference dose

FCR = fish consumption rate (17.5 gm/person-day)

BCF = bioconcentration factor

BCF values are based on U. S. Environmental Protection Agency publications pursuant to Section 304(a) of the Clean Water Act.

FCR values are average consumption rates for a 70 kg adult for a

lifetime of the population; alternative FCR values may be used when it is considered necessary to protect localized populations which may be consuming fish at a higher rate.

(2) Water consumption and fish tissue consumption:

$$WQC = (RfD) \times \text{Body Weight} / (WCR + (FCR \times BCF))$$

where: WQC = water quality criterion  
RfD = reference dose  
FCR = fish consumption rate (17.5 gm/person-day)  
BCF = bioconcentration factor  
WCR = water consumption rate (assumed to be 2liters/day for adults)

The equations listed in this subparagraph will be used to develop water criteria or standards on a case-by-case basis for toxic substances that are not presently included in the water quality standards. Alternative FCR values may be used when it is considered necessary to protect localized populations that may be consuming fish at a higher rate.

- (g) For carcinogens, the concentrations of toxic substances will not result in unacceptable health risk and will be based on a Cancer Potency Factor (CPF). An unacceptable health risk for cancer will be considered to be more than one additional case of cancer per one million people exposed (10<sup>-6</sup> risk level). Water quality standards or criteria used to calculate water quality-based effluent limitations (and for all other purposes of water quality criteria under Section 303(c) of the Clean Water Act) to protect human health through the different exposure routes are determined as follows:

(1) Fish tissue consumption:

$$WQC = (\text{Risk}) \times \text{Body Weight} / (\text{CPF} \times (\text{FCR} \times \text{BCF}))$$

where: WQC = water quality criterion  
Risk = risk factor (10<sup>-6</sup>)  
CPF = cancer potency factor  
FCR = fish consumption rate (17.5 gm/person-day)  
BCF = bioconcentration factor

BCF values are based on U.S. Environmental Protection Agency publications pursuant to Section 304(a) of the Clean Water Act. FCR values are average consumption rates for a 70 kg adult for a lifetime of the population;

alternative FCR values may be used when it is considered necessary to protect localized populations which may be consuming fish at a higher rate.

(2) Water consumption (including a correction for fish consumption):

$$\text{WQC} = \text{Risk} \times \text{Body Weight} / (\text{CPF} \times (\text{WCR} + (\text{FCR} \times \text{BCF})))$$

where: WQC = water quality criterion

Risk = risk factor (10)

CPF = cancer potency factor

FCR = fish consumption rate (17.5 gm/person-day)

BCF = bioconcentration factor

WCR = water consumption rate (assumed to be 2 liters/day for adults)

The equations listed in this subparagraph will be used to develop water criteria or standards on a case-by-case basis for toxic substances that are not presently included in the water quality standards. Alternative FCR values may be used when it is considered necessary to protect localized populations that may be consuming fish at a higher rate.

## TABLE 2 Notes

- a** The  $CMC = 1/[(f_1/CMC_1) + (f_2/CMC_2)]$  where  $f_1$  and  $f_2$  are the fractions of total selenium that are treated as selenite and selenate, respectively, and  $CMC_1$  and  $CMC_2$  are 185.9  $\mu\text{g/l}$  and 12.83  $\mu\text{g/l}$ . The value in the table is calculated assuming a worst case scenario in which all selenium is present as selenate.
- b** Hardness dependent parameter. Criteria are indicated at hardness of 50 mg/l as  $\text{CaCO}_3$ . Equations for criteria calculation of hardness dependent parameters can be found in *Quality Criteria for Water*. The equation is applicable for instream hardness ranges from 25 mg/l to 400 mg/l. If instream hardness is less than 25 mg/l, then a hardness value of 25 mg/l should be used to calculate the criteria. If instream hardness is greater than 400 mg/l, then a hardness of 400 mg/l should be used to calculate the criteria.
- c** Criteria for pentachlorophenol are based on a pH dependent equation as found in *Quality Criteria for Water*. Values listed are for a pH of 7.0 s.u.
- d** Site specific criteria for Mississippi Sound.
- e** Parameter subject to water effects ratio equations where:  
 $CMC = WER * \text{Acute}$   
 $CCC = WER * \text{Chronic}$
- f** Ammonia criteria are dependent on pH, temperature, and/or salinity. See Section II.10.C.
- g** Expressed as  $\mu\text{g}$  free cyanide (as CN)/L.
- h** Refers to the inorganic form only.
- i** Applies to the sum of  $\alpha$  and  $\beta$  isomers.
- j** Chemical Abstracts Service (CAS) registry numbers, which provide a unique identification for each chemical.
- k** This criterion applies to total PCBs (e.g., the sum of all congener or all isomer or homolog or Aroclor analyses).

**TABLE 2**  
**Numeric Criteria for All Waters (µg/l)**

CAS j	Parameter	Fresh Water		Salt Water		Human Health	
		Acute	Chronic	Acute	Chronic	Organisms Only	Water & Organisms
309002	Aldrin	3.0		1.3		0.000050	0.000049
7664417	Ammonia	f	f	f	f		
7440382	Arsenic (III), Total Dissolved	340 <sup>e</sup>	150 <sup>e</sup>	69	36		
7440382	Arsenic, Total Dissolved					24 <sup>h</sup>	0.078 <sup>h</sup>
7440439	Cadmium, Total Dissolved	1.03 <sup>b,e</sup>	0.15 <sup>b,e</sup>	40	8.8	168	5
57749	Chlordane	2.4	0.0043	0.09	0.004	0.00081	0.00080
7782505	Chlorine	19	11	13	7.5		
18540299	Chromium (Hex), Total Dissolved	16 <sup>e</sup>	11 <sup>e</sup>	1100	50	1470	98
16065831	Chromium (III), Total Dissolved	323 <sup>b,e</sup>	42 <sup>b,e</sup>			140468	100
7440508	Copper, Total Dissolved	7.0 <sup>b,e</sup>	5.0 <sup>b,e</sup>	4.8	3.1	1000	1300
57125	Cyanide	22.0 <sup>g</sup>	5.2 <sup>g</sup>	1.0 <sup>g</sup>	1.0 <sup>g</sup>	140	140
50293	4,4 DDT	1.1	0.001	0.13	0.001	0.00022	0.00022
60571	Dieldrin	0.24	0.056	0.71	0.0019	0.000054	0.000052
1746016	2,3,7,8 TCDD (Dioxin)					51 x 10 <sup>-9</sup>	50 x 10 <sup>-9</sup>
959988	alpha-Endosulfan	0.22 <sup>1</sup>	0.056 <sup>1</sup>	0.034 <sup>1</sup>	0.0087 <sup>1</sup>	89	62 <sup>j</sup>
33213659	beta-Endosulfan	0.22 <sup>1</sup>	0.056 <sup>1</sup>	0.034 <sup>1</sup>	0.0087 <sup>1</sup>	89 <sup>j</sup>	62
1031078	Endosulfan Sulfate					89 <sup>j</sup>	62 <sup>j</sup>
72208	Endrin	0.086	0.036	0.037	0.0023	0.060	0.059
76448	Heptachlor	0.52	0.0038	0.053	0.0036	0.000079	00.00079

58899	gamma-BHC (Lindane)	0.95	0.08	0.16		1.8	0.98
7439921	Lead, Total Dissolved	30 <sup>b,e</sup>	1.18 <sup>b,e</sup>	210	8.1		15
7439976	Mercury (II), Total Dissolved	2.1e	0.012	1.8	0.025		
7439976	Mercury					0.153	0.151
7440020	Nickel, Total Dissolved	260 <sup>b,e</sup>	29 <sup>b,e</sup>	75	8.3	4600	610
108952	Phenol	300	102	300	58	860000	10000
87865	Pentachlorophenol	8.7 <sup>c</sup>	6.7 <sup>c</sup>	13 <sup>c</sup>	7.9 <sup>c</sup>	3.0	0.27
	Total PCB	0.02 <sup>k</sup>	0.014 <sup>k</sup>	1.0 <sup>k</sup>	0.03 <sup>k</sup>	0.000064 <sup>k</sup>	0.000064 <sup>k</sup>
7782492	Selenium, Total Dissolved	11.8 <sup>a,e</sup>	4.6 <sup>e</sup>	290 <sup>e</sup>	71 <sup>e</sup>	4200	170
7440224	Silver, Total Dissolved	0.98 <sup>b,f</sup>		1.9			100
8001352	Toxaphene	0.73	0.0002	0.21	0.0002	0.00028	0.00028
7440666	Zinc, Total Dissolved	65 <sup>b,e</sup>	65 <sup>b,e</sup>	90	81	26,000	7,400

Source: Miss. Code Ann. §§ 49-2-9, 49-2-1, et seq., and 49-17-1, et seq.

*Rule 2.3 Specific Water Quality Criteria:*

A. PUBLIC WATER SUPPLY CLASSIFICATION:

Waters in this classification are a source of raw water supply for drinking and food processing purposes. The water treatment process shall be approved by the Mississippi State Department of Health. The raw water supply shall be such that after the approved treatment process, it will satisfy the regulations established pursuant to Section 1412 of the Public Health Service Act as amended by the Safe Drinking Water Act (Pub. L. 93-523). Information regarding surface water intakes for Public Water Supply is provided in Table 3.

**Table 3. Mississippi Surface Water Intakes for Public Water Supply**

<b>Water Body</b>	<b>Name</b>	<b>Location</b>	<b>Status</b>
Bonita Reservoir	City of Meridian	Lauderdale County	Inactive
Long Creek Reservoir	City of Meridian	Lauderdale County	Inactive
Luxapallila Creek	Columbus Light and Water	Lowndes County	Inactive
Okatibbee Reservoir	Pat Harrison Waterway District	Lauderdale County	Inactive
Pascagoula River	Jackson County Port Authority	Jackson County	Active
Pickwick Lake (Yellow Creek Embayment)	Short Coleman Park Water Association	Tishomingo County	Inactive
Ross Barnett Reservoir Pearl River	City of Jackson	Hinds County	Active
Tenn-Tom Waterway	City of Corinth Gas and Water Department	Tishomingo County	Under Construction
Tombigbee River	NE MS Regional Water Supply District	Itawamba County	Active

Waters that meet the Public Water Supply criteria shall also be suitable for secondary contact recreation. Secondary contact recreation is defined as incidental contact with the water during activities such as wading, fishing, and boating, that are not likely to result in full body immersion. In considering the acceptability of a proposed site for disposal of bacteria latent wastewater in or near waters with the public water supply classification, the Permit Board shall consider the relative proximity of the discharge to water supply intakes.

- (1) Bacteria: For the months of May through October, when water contact recreation activities may be expected to occur, fecal coliform shall not exceed a geometric mean of 200 per 100 ml based on a minimum of 5 samples taken over a 30-day period with no less than 12 hours between individual samples, nor shall the

samples examined during a 30-day period exceed 400 per 100 ml more than 10% of the time.

For the months of November through April, when incidental recreational contact is not likely, fecal coliform shall not exceed 2000 per 100 ml as a geometric mean (either MPN or MF count) based on at least 5 samples taken over a 30-day period with no less than 12 hours between individual samples, nor shall the samples examined during a 30-day period exceed 4000 per 100 ml more than 10% of the time.

- (2) Chlorides (Cl): There shall be no substances added which will cause the chloride content to exceed 230 mg/l in freshwater streams.
- (3) Specific Conductance: There shall be no substances added to increase the conductivity above 500 micromhos/cm for freshwater streams.
- (4) Dissolved Solids: There shall be no substances added to the waters that will cause the dissolved solids to exceed 500 mg/l for freshwater streams.
- (5) Threshold Odor: There shall be no substances added which will cause the threshold odor number to exceed 24 (at 60°C) as a daily average.
- (6) Radioactive Substances: There shall be no radioactive substances added to the waters which will cause the gross beta activity (in the known absence of Strontium-90 and alpha emitters) to exceed 1000 picocuries per liter at any time.
- (7) Specific Chemical Constituents: In addition to the provisions in Section II.4. and 10., the following concentrations (dissolved) shall not be exceeded at any time:

<u>Constituent</u>	<u>Concentration (mg/l)</u>
Barium	2.0
Fluoride	2.0
Lead	0.015
Nitrate (as N)	10.0

#### B. SHELLFISH HARVESTING CLASSIFICATION

Waters in this classification are for propagation and harvesting shellfish for sale or use as a food product. These waters shall meet the requirements set forth in the latest edition of the *National Shellfish Sanitation Program, Manual of Operations, Part I, Sanitation of Shellfish Growing Areas*, as published by the U. S. Public Health Service. Waters that meet the Shellfish Harvesting Area Criteria shall also be suitable for recreational purposes. In considering the acceptability of a proposed site for disposal of bacteria latent wastewater in or near waters with this classification, the Permit Board shall consider the relative proximity of the discharge to shellfish harvesting beds.

- (1) Bacteria: The median fecal coliform MPN (Most Probable Number) of the water shall not exceed 14 per 100 ml, and not more than 10% of the samples shall

ordinarily exceed an MPN of 43 per 100 ml in those portions or areas most probably exposed to fecal contamination during most unfavorable hydrographic and pollutive conditions.

C. RECREATION CLASSIFICATION:

Waters in this classification are to be suitable for recreational purposes, including such water contact activities as swimming and water skiing. In considering the acceptability of a proposed site for disposal of bacteria latent wastewater in or near waters with this classification, the Permit Board shall consider the relative proximity of the discharge to areas of actual water contact activity.

- (1) Bacteria: Fecal coliform shall not exceed a geometric mean of 200 per 100 ml based on a minimum of 5 samples taken over a 30-day period with no less than 12 hours between individual samples, nor shall the samples examined during a 30-day period exceed 400 per 100 ml more than 10% of the time. For both marine and estuarine coastal recreational waters, Enterococci shall not exceed a seasonal (May – October and November – April) geometric mean of 35 per 100 ml based on a minimum of 20 samples collected during each season. Coastal recreational waters do not include inland waters upstream of the mouth of a river or a stream having a natural connection to the open sea.
- (2) Specific Conductance: There shall be no substances added to increase the conductivity above 1000 micromhos/cm for freshwater streams.
- (3) Dissolved Solids: There shall be no substances added to the water to cause the dissolved solids to exceed 750 mg/l as a monthly average value, nor exceed 1500 mg/l at any time for freshwater streams.

D. FISH AND WILDLIFE CLASSIFICATION:

Waters in this classification are intended for fishing and for propagation of fish, aquatic life, and wildlife. Waters that meet the Fish and Wildlife Criteria shall also be suitable for secondary contact recreation. Secondary contact recreation is defined as incidental contact with the water during activities such as wading, fishing, and boating, that are not likely to result in full body immersion.

- (1) Bacteria: For the months of May through October, when water contact recreation activities may be expected to occur, fecal coliform shall not exceed a geometric mean of 200 per 100 ml based on a minimum of 5 samples taken over a 30-day period with no less than 12 hours between individual samples, nor shall the samples examined during a 30-day period exceed 400 per 100 ml more than 10% of the time.

For the months of November through April, when incidental recreational contact is not likely, fecal coliform shall not exceed a geometric mean of 2000 per 100 ml based on a minimum of 5 samples taken over a 30-day period with no less than 12

hours between individual samples, nor shall the samples examined during a 30-day period exceed 4000 per 100 ml more than 10% of the time.

- (2) Specific Conductance: There shall be no substances added to increase the conductivity above 1000 micromhos/cm for freshwater streams.
- (3) Dissolved Solids: There shall be no substances added to the waters to cause the dissolved solids to exceed 750 mg/l as a monthly average value, nor exceed 1500 mg/l at any time for freshwater streams.

E. EPHEMERAL STREAM CLASSIFICATION:

Waters in this classification do not support a fisheries resource and are not usable for human consumption or aquatic life. Ephemeral streams normally are natural watercourses, including natural watercourses that have been modified by channelization or a manmade drainage ditch, that without the contribution of point source discharges, flow only in direct response to precipitation or irrigation return-water discharge in the immediate vicinity and whose channels are normally above the groundwater table. Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses. These streams may contain a transient population of aquatic life during the portion of the year when there is suitable habitat for fish survival. Normally, aquatic habitat in these streams is not adequate to support a reproductive cycle for fish and other aquatic life. Wetlands are excluded from this classification.

Waters in this classification shall be protective of wildlife and humans that may come in contact with the waters. Waters contained in ephemeral streams shall also allow maintenance of the standards applicable to all downstream waters.

- (1) Provisions A, B, C, and E of Rule 2.2 (Minimum Conditions Applicable to All Waters: Narrative Standards) are applicable except as they relate to fish and other aquatic life. All aspects of provisions 2.2.A.4) and 2.2.F. concerning toxicity will apply to ephemeral streams, except for domestic or compatible domestic wastewater discharges which will be required to meet toxicity requirements in downstream waters not classified as ephemeral. Alternative methods may be utilized to determine the potential toxic effect of ammonia. Acutely toxic conditions are prohibited under any circumstances in waters in this classification.
- (2) Dissolved Oxygen: The dissolved oxygen shall be maintained at an appropriate level to avoid nuisance conditions.
- (3) Bacteria: The Permit Board may assign bacterial criteria where the probability of a public health hazard or other circumstances so warrant.
- (4) Fisheries resource is defined as any water body which has a viable gamefish population as documented by the Mississippi Department of Wildlife Fisheries and Parks or has sufficient flow or physical characteristics to support the fishing

use during times other than periods of flow after precipitation events or irrigation return water discharge.

- (5) "Not usable for human consumption or aquatic life" means that sufficient flow or physical characteristics are not available to support these uses.
- (6) "Flow only in response to precipitation or irrigation return water" means that without the influence of point source discharges the stream will be dry unless there has been recent rainfall or a discharge of irrigation return water.
- (7) "Protective of wildlife and humans that may come in contact with the waters" means that toxic pollutants shall not be discharged in concentrations that will endanger wildlife or humans.
- (8) "Nuisance conditions" means objectionable odors or aesthetic conditions that may generate complaints from the public.

Recommendations for assignment of the Ephemeral Stream classification shall be made to the Commission on Environmental Quality by the Permit Board after appropriate demonstration of physical and hydrological data. The Ephemeral Stream classification shall not be assigned where environmental circumstances are such that a nuisance or hazardous condition would result or public health is likely to be threatened. Alternate discharge points shall be investigated before the Ephemeral Stream classification is considered.

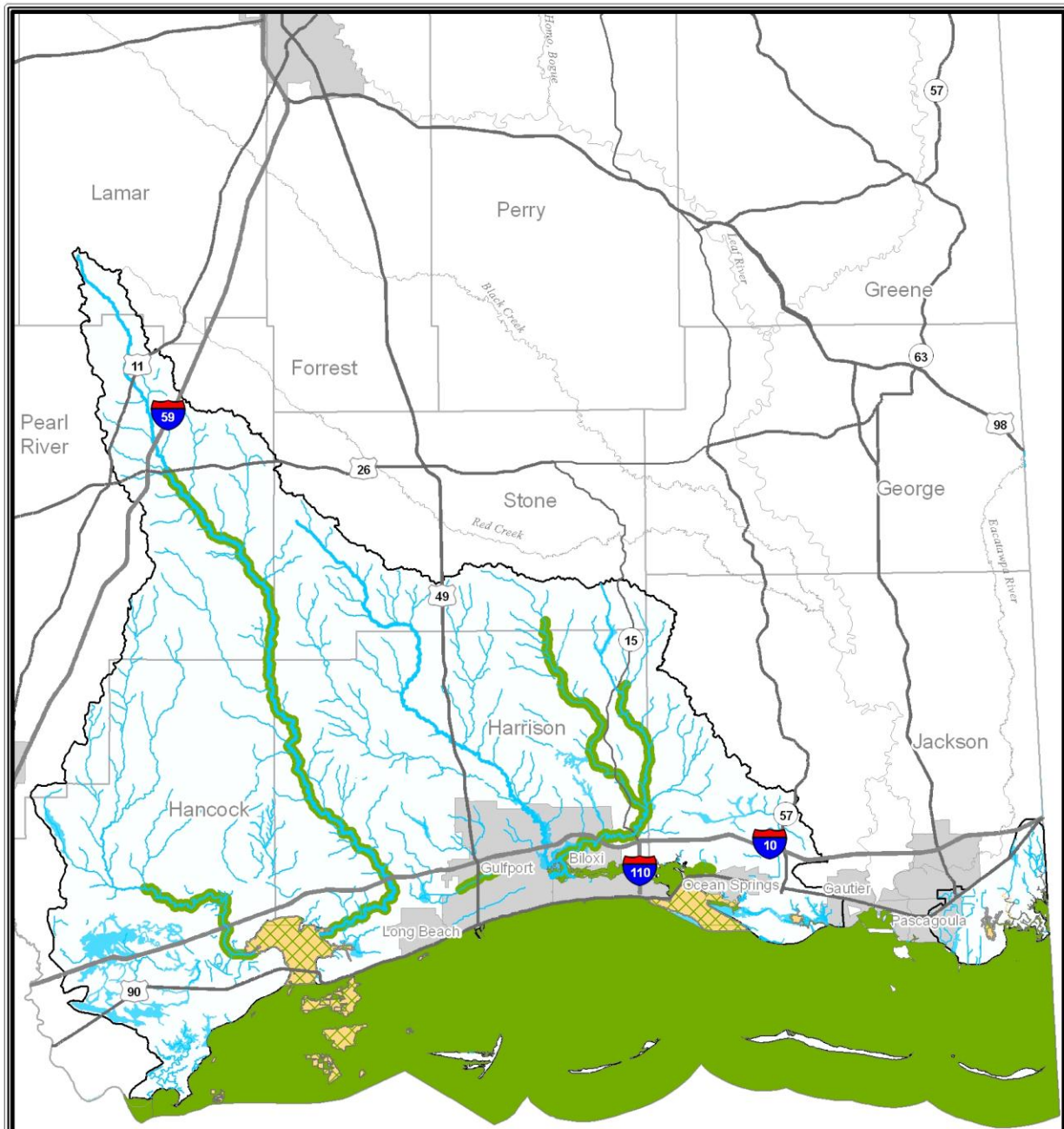
Source: Miss. Code Ann. §§ 49-2-9, 49-2-1, *et seq.*, and 49-17-1, *et seq.*

*Rule 2.4 Water Body Classifications in State Waters:*

All of the State waters not specifically listed below shall be classified as Fish and Wildlife. State waters carrying other classifications are:

<b>Coastal Streams Basin</b>		
<b>Waters</b>	<b>Location</b>	<b>Classification</b>
Back Bay of Biloxi	From Popp's Ferry Bridge to Biloxi Bay	Recreation
Bangs Lake	From headwaters to the Mississippi Sound	Shellfish Harvesting
Bayou Cumbest	From headwaters to the Mississippi Sound	Shellfish Harvesting
Big Lake	From Bernard Bayou to the Popp's Ferry Bridge	Recreation
Biloxi Bay	From Headwaters (US Hwy 90 Bridge) to the Mississippi Sound	Shellfish Harvesting Recreation
Buoy Beef	Mississippi Sound	Shellfish Harvesting Recreation
Davis Bayou	From headwaters to the Biloxi Bay	Shellfish Harvesting
Graveline Bay	From headwaters to Graveline Bayou	Shellfish Harvesting
Graveline Bayou	From Graveline Bay to the Mississippi Sound	Shellfish Harvesting
Jourdan River	From confluence of Bacon Bayou and Catahoula Creek to the St. Louis Bay	Recreation
Kittiwake Reef (Long Beach Reef)	Mississippi Sound	Shellfish Harvesting Recreation
Mallini Bayou	From St. Louis Bay to St. Louis Bay	Shellfish Harvesting
Mississippi Sound	Contiguous to Mississippi Coastline	Recreation
Old Fort Bayou	From Bayou Talla to Biloxi Bay	Recreation
Pass Christian Reef (off Henderson Point)	Mississippi Sound	Shellfish Harvesting Recreation
Pass Marianne Reef	Mississippi Sound	Shellfish Harvesting Recreation
Pelican Key Reef	Mississippi Sound	Shellfish Harvesting Recreation
Point Clear Shell Plant	Mississippi Sound	Shellfish Harvesting Recreation
St. Joe Reef (St. Joseph's Point Reef)	Mississippi Sound	Shellfish Harvesting Recreation
St. Louis Bay	Harrison and Hancock Counties	Shellfish Harvesting Recreation
Tchoutacabouffa River	From headwaters to the Back Bay of Biloxi	Recreation

<b>Coastal Streams Basin</b>		
<b>Waters</b>	<b>Location</b>	<b>Classification</b>
St. Louis Bay	Harrison and Hancock Counties	Shellfish Harvesting Recreation
St. Stanislaus Reef	Mississippi Sound	Shellfish Harvesting Recreation
Tchoutacabouffa River	From headwaters to the Back Bay of Biloxi	Recreation
Telegraph Reef	Mississippi Sound	Shellfish Harvesting Recreation
Turkey Creek	From Forest Heights Middle School to Bernard Bayou	Recreation
Tuxachanie Creek	From headwaters to the Tchoutacabouffa River	Recreation
Waveland Reef	Mississippi Sound	Shellfish Harvesting Recreation
Wolf River	From MS Hwy 26 to the St. Louis Bay	Recreation

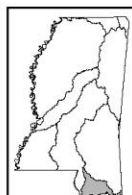


## Coastal Streams Basin Water Quality Standards

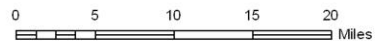
This map produced by the Department of Environmental Quality (MDEQ), Office of Pollution Control, Surface Water Division, Standards, Modeling, and TMDL Branch on October 30, 2009.

All map data is from the Mississippi Automated Resource Information System (MARIS) and MDEQ.  
Map Projection: Mississippi Transverse Mercator

The Mississippi Department of Environmental Quality makes no warranties, expressed or implied, as to the accuracy, completeness, currentness, reliability, or suitability for any particular purpose, of the data contained on this map.



Mississippi Basins



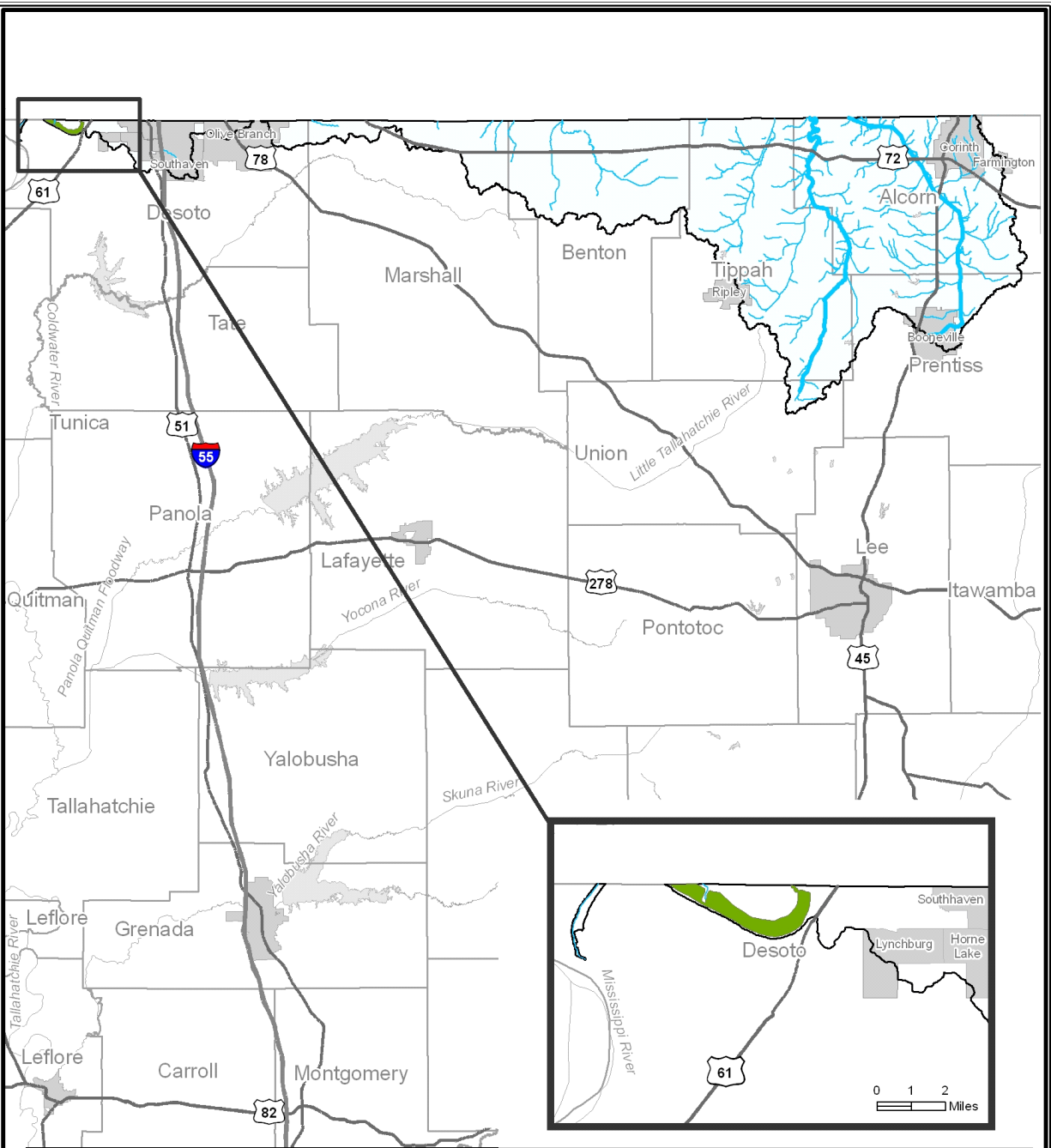
### Legend

#### Water Quality Standards Classification

- Shellfish Harvesting
- Shellfish Harvesting & Recreation
- Recreation
- Fish & Wildlife

- Interstate
- US Highway
- State Highway
- County Boundary
- Basin Boundary
- City
- Major River
- Reservoir or Lake

<b>North Independent Streams Basin</b>		
<b>Waters</b>	<b>Location</b>	<b>Classification</b>
Horn Lake	DeSoto County	Recreation

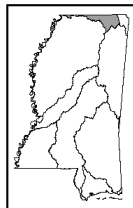


## North Independent Streams Basin Water Quality Standards

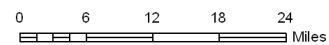
This map produced by the Department of Environmental Quality (MDEQ), Office of Pollution Control, Surface Water Division, Standards, Modeling, and TMDL Branch on October 30, 2009.

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Mississippi Basins

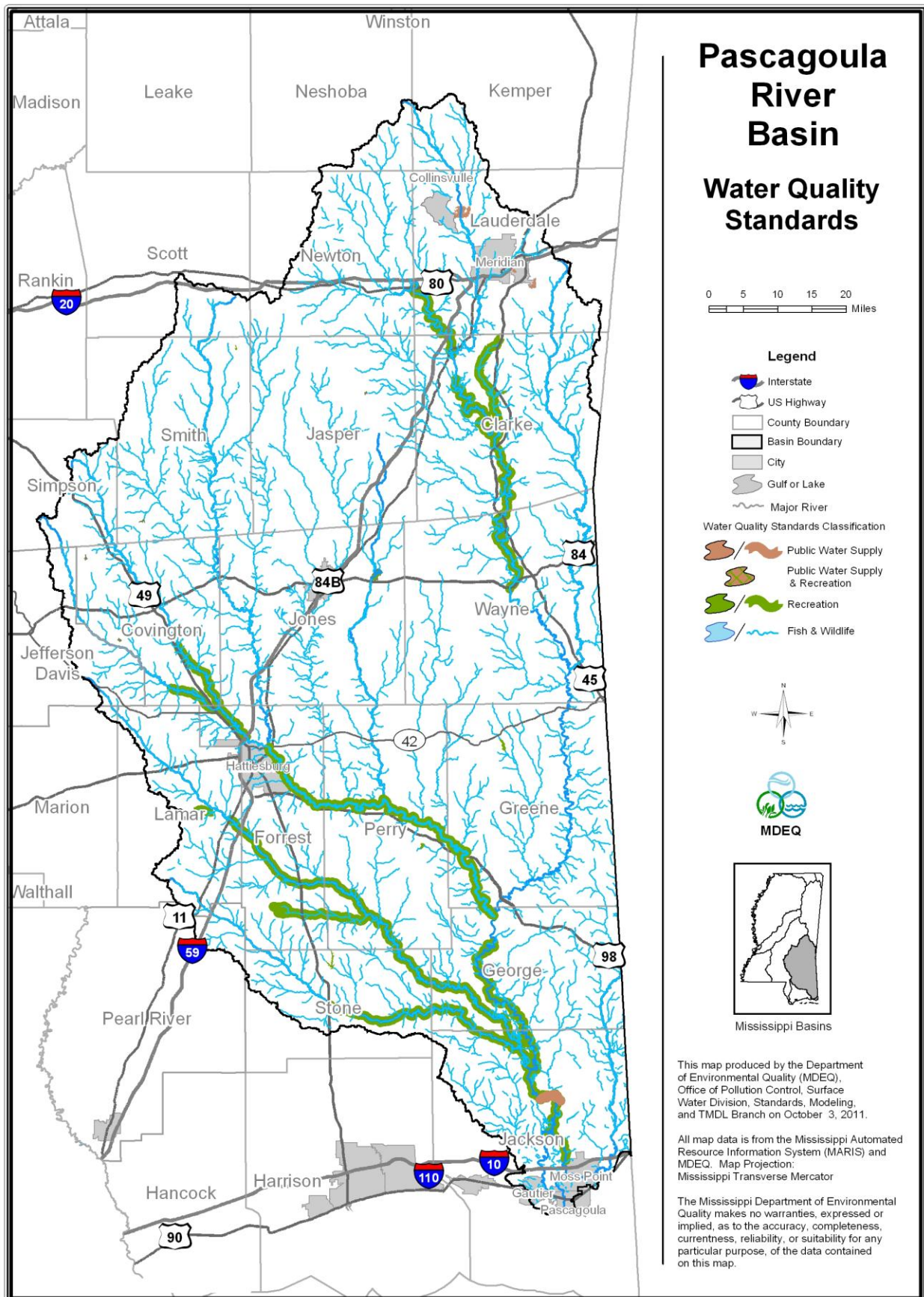


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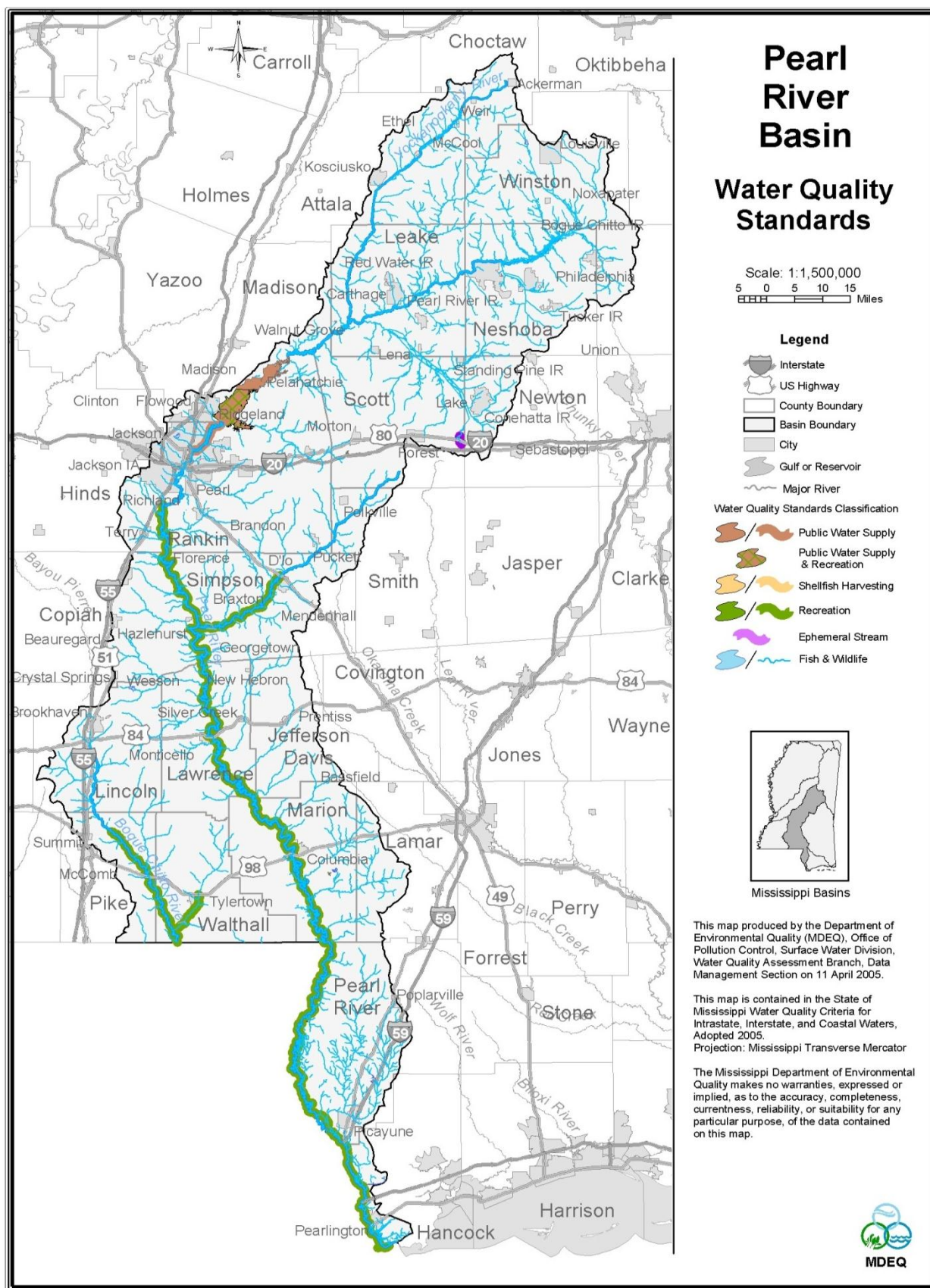
- |  |                   |
|--|-------------------|
| Water Quality Standards Classification | Interstate        |
| Recreation                             | US Highway        |
| Fish & Wildlife                        | County Boundary   |
|  | Basin Boundary    |
|  | City              |
|  | Major River       |
|  | Reservoir or Lake |

<b>Pascagoula River Basin</b>		
<b>Waters</b>	<b>Location</b>	<b>Classification</b>
Archusa Reservoir	Clarke County	Recreation
Beaverdam Creek	From headwaters in Perry and Forrest Counties to Black Creek	Recreation
Black Creek	From Hwy 11 to the Pascagoula River	Recreation
Bonita Reservoir	Lauderdale County	Public Water Supply
Bowie Creek	From MS Hwy 589 to the Bowie River	Recreation
Bowie River	From Bowie Creek to Interstate 59	Recreation
Chickasawhay River	From Stonewall to MS Hwy 84	Recreation
Chunky River	From US Hwy 80 to the Chickasawhay River	Recreation
Clarke State Park (Ivy Lake)	Clarke County	Recreation
Dry Creek Lake Site #3	Covington County	Recreation
Escatawpa River	From River Mile 10 to the Pascagoula River	Fish and Wildlife <sup>1</sup>
Flint Creek Reservoir	Stone County	Recreation
Lake Bogue Homa	Jones County	Recreation
Lake Claude Bennett	Jasper County	Recreation
Lake Geiger	Forrest County	Recreation
Lake Marathon	Smith County	Recreation
Lake Mike Conner	Covington County	Recreation
Lake Perry	Perry County	Recreation
Lake Ross Barnett	Smith County	Recreation
Lake Shongela	Smith County	Recreation
Lakeland Park Lake	Wayne County	Recreation
Leaf River	From Hwy 42 to the Chickasawhay River	Recreation
Long Creek Reservoir	Lauderdale County	Public Water Supply
Okatibbee Reservoir	Lauderdale County	Public Water Supply Recreation
Okatoma Creek	From Seminary (MS Hwy 590) to the Bowie River	Recreation
Pascagoula River	From 5 miles north of Cumbest Bluff to Cumbest Bluff	Public Water Supply
Pascagoula River	From 6 miles north of MS Hwy 26 (George County) to Smear Bayou (Jackson County)	Recreation
Red Creek	From US Hwy 49 to Big Black Creek	Recreation
Turkey Creek Reservoir	Greene County	Recreation

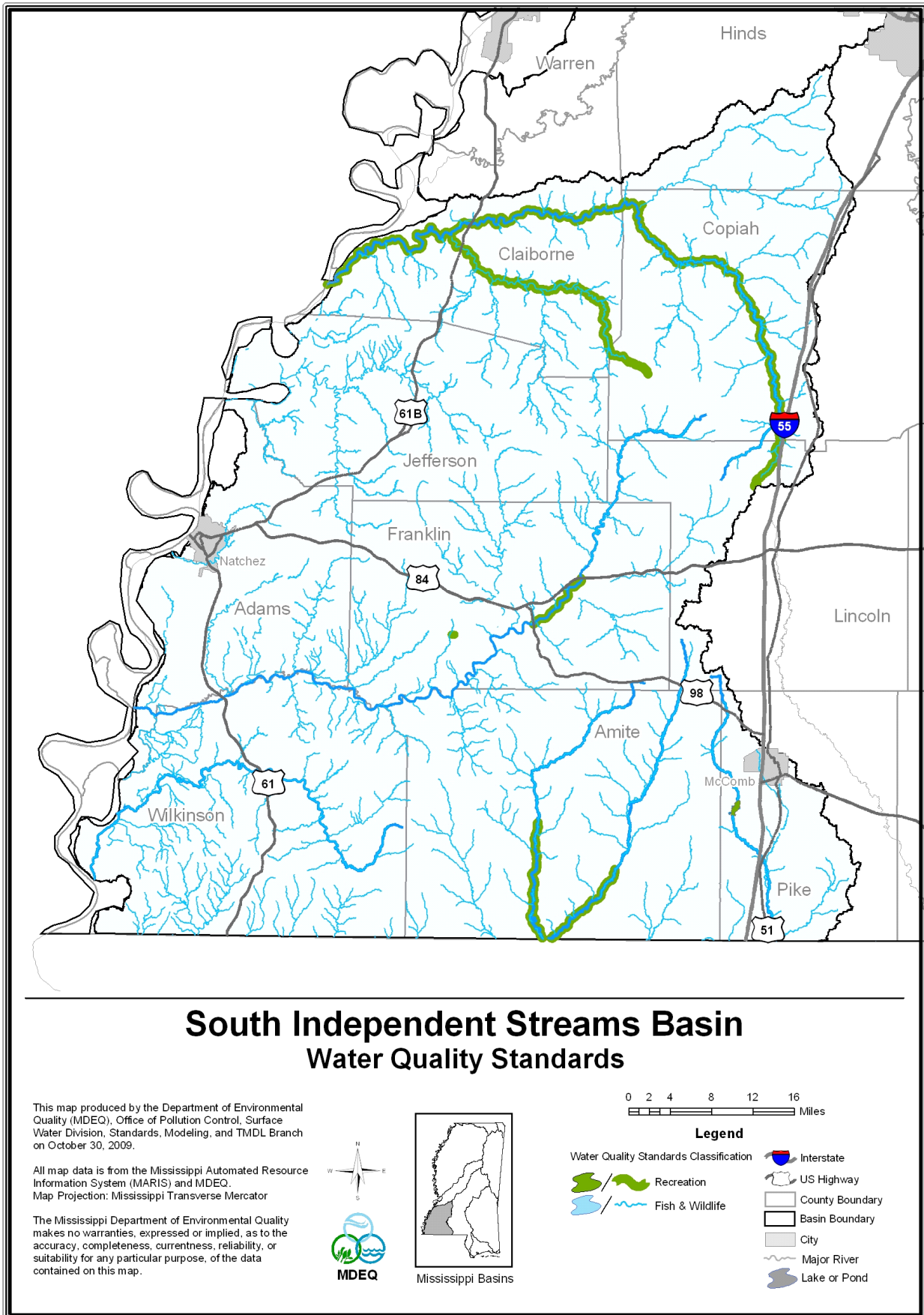
<sup>1</sup> The following dissolved oxygen standard is applicable for this segment: dissolved oxygen concentrations shall not be less than a daily average of 3.7 mg/l from May 1 through October 31. Additional information regarding the derivation and implementation of this criterion can be found in the report titled *A Site-Specific Dissolved Oxygen Criterion for the Escatawpa River: Criteria Derivation and Implementation*.



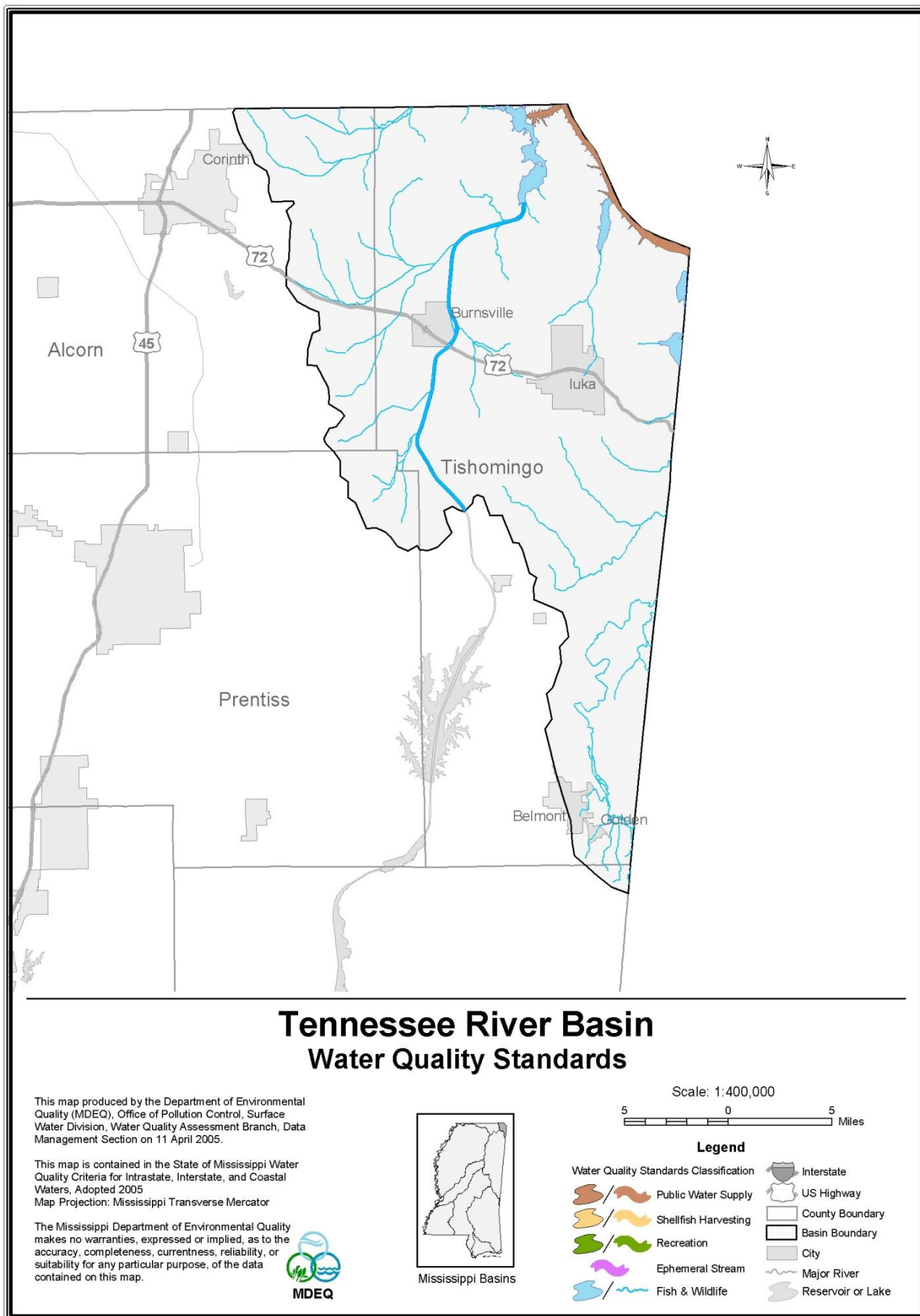
<b>Pearl River Basin</b>		
<b>Waters</b>	<b>Location</b>	<b>Classification</b>
Ross Barnett Reservoir	Madison and Rankin Counties	Recreation
Ross Barnett Reservoir	From River Bend to the Reservoir Dam	Public Water Supply
Bogue Chitto River	From MS Hwy 570 to the MS/LA State Line	Recreation
Lake Columbia	Marion County	Recreation
Lake Dixie Springs	Pike County	Recreation
Magees Creek	From US Hwy 98 to the Bogue Chitto River	Recreation
Pearl River	From Barnett Reservoir to the City of Jackson Water Intake	Public Water Supply
Pearl River (including Ross Barnett Reservoir)	From Hwy 16 near Edinburg to the Mississippi Sound	Recreation
Strong River	From US Hwy 49 to the Pearl River	Recreation
Shadow Lake (Roosevelt State Park)	Scott County	Recreation
Legion Lake	Simpson County	Recreation
Unnamed Drainage Ditch	From Lake POTW ( MS0025194) to Warrior Branch	Ephemeral



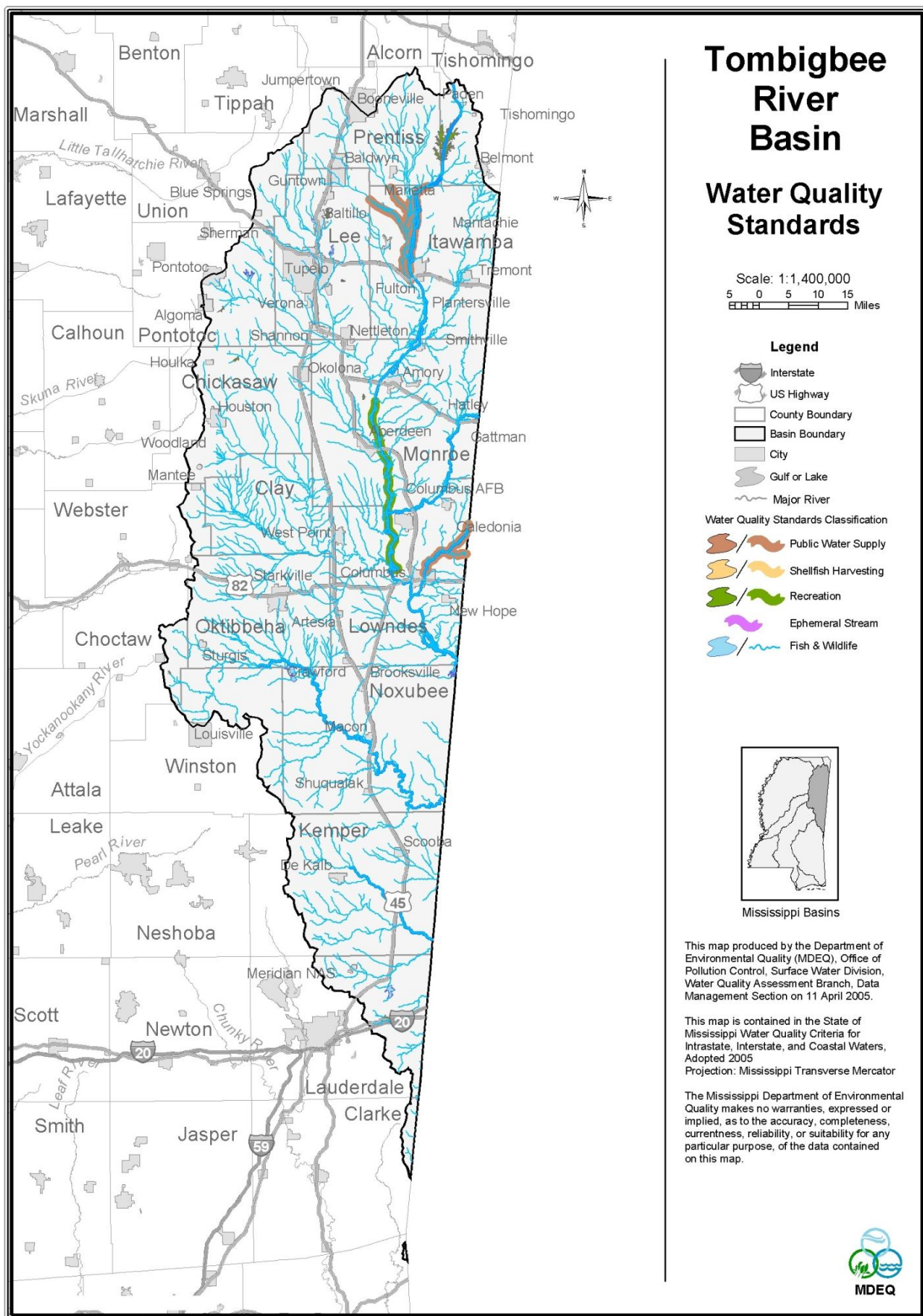
<b>South Independent Streams Basin</b>		
<b>Waters</b>	<b>Location</b>	<b>Classification</b>
Bayou Pierre	From headwaters to the Mississippi River	Recreation
Clear Springs Lake	Franklin County	Recreation
East Fork Amite River	From MS Hwy 584 to the MS/LA State Line	Recreation
Homochitto River	From US Hwy 84 to US Hwy 98	Recreation
Little Bayou Pierre	From headwaters to Bayou Pierre	Recreation
Percy Quinn State Park Lake	Pike County	Recreation
West Fork Amite River	From MS Hwy 24 to the MS/LA State Line	Recreation



<b>Tennessee River Basin</b>		
<b>Waters</b>	<b>Location</b>	<b>Classification</b>
Bear Creek	From MS/AL State Line to the MS/AL State Line	Recreation
Pickwick Lake (including Yellow Creek Embayment)	Tishomingo County	Public Water Supply Recreation
Tennessee River	From MS/AL State Line to the MS/TN State Line	Public Water Supply Recreation
Tenn-Tom Waterway	From Pickwick Lake to Little Yellow Creek	Public Water Supply Recreation

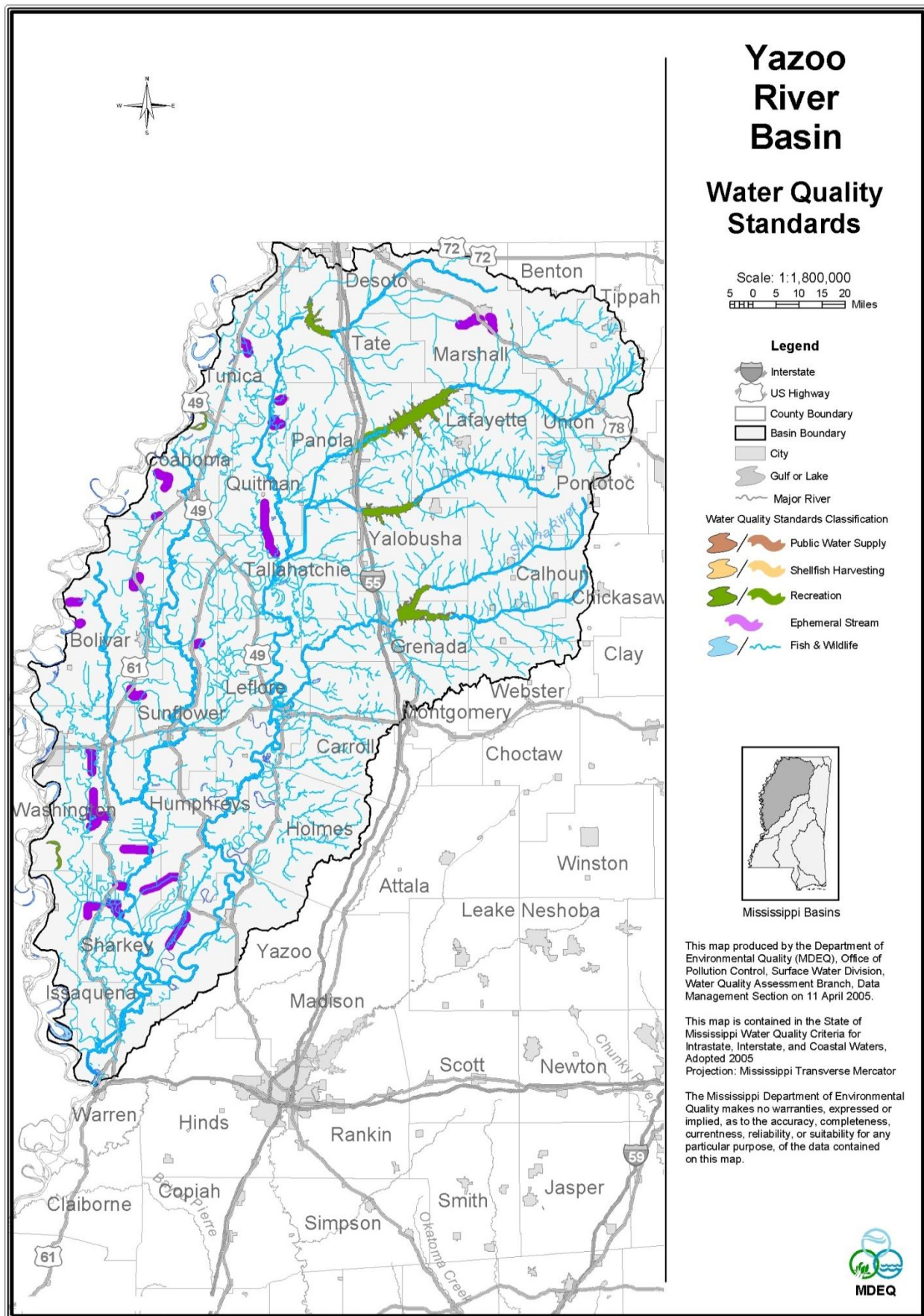


<b>Tombigbee River Basin</b>		
<b>Waters</b>	<b>Location</b>	<b>Classification</b>
Aberdeen Lake (Tenn-Tom Waterway)	From Mile 355.5 to Mile 364.3 (Normal Pool Elevation 190.0)	Recreation
Bay Springs Lake (Tenn-Tom Waterway)	From Mile 410.0 to Mile 419.0 (Normal Pool Elevation 414.0)	Recreation
Canal Section Pool "C" (Tenn-Tom Waterway)	From Mile 389.0 to Mile 396.4 (Normal Pool Elevation 270.0)	Recreation
Chiwapa Reservoir	Pontotoc County	Recreation
Choctaw Lake	Choctaw County	Recreation
Columbus Lake (Tenn-Tom Waterway)	From Mile 332.9 to Mile 355.5 (Normal Pool Elevation 163.0)	Recreation
Davis Lake	Chickasaw County	Recreation
Donivan Creek	From Natchez Trace Parkway to the Tombigbee River	Public Water Supply
Lake Lamar	Lee County	Recreation
Lake Lowndes	Lowndes County	Recreation
Lake Monroe	Monroe County	Recreation
Lake Tom Bailey	Lauderdale County	Recreation
Luxapallila Creek	From the MS/AL State Line to Hwy 50	Public Water Supply Recreation
Oktibbeha County Lake	Oktibbeha County	Recreation
Tenn-Tom Waterway	From Montgomery Lock Dam to Hwy 25 near Fulton	Public Water Supply
Twentymile Creek	From Natchez Trace Parkway to the Tombigbee River	Public Water Supply
Tombigbee River	From Boat Ramp Road to Hwy 78	Public Water Supply
Tombigbee State Park Reservoir	Lee County	Recreation
Yellow Creek	From the MS/AL State Line to Luxapallila Creek	Public Water Supply



<b>Yazoo River Basin</b>		
<b>Waters</b>	<b>Location</b>	<b>Classification</b>
Arkabutla Reservoir	DeSoto and Tate Counties	Recreation
Canal #12	From Delta City Utility District (MS0038164) to the Big Sunflower River	Ephemeral
Chewalla Reservoir	Marshall County	Recreation
Drainage Ditch #3	From Rosedale POTW (MS0020630) to Lane Bayou	Ephemeral
Enid Reservoir	Panola, Lafayette, and Yalobusha Counties	Recreation
Grenada Reservoir	Grenada County	Recreation
Lake Dumas	Tippah County	Recreation
Lake Washington	Washington County	Recreation
Little Tallahatchie River	From Sardis Reservoir to US Hwy 51	Recreation
Moon Lake	Coahoma County	Recreation
Sardis Reservoir	Panola and Lafayette Counties	Recreation
Straight Bayou Drainage Main Ditch "A"	From Louise POTW (MS0044512) to Unnamed Tributary of Silver Creek	Ephemeral
Tillatoba Lake	Yalobusha County	Recreation
Unnamed Drainage Canal	From Anguilla POTW (MS0020541) to the Big Sunflower River	Ephemeral
Unnamed Drainage Ditch	From Arcola POTW (MS0037311) to Black Bayou	Ephemeral
Unnamed Drainage Ditch	From Beulah POTW (MS0042285) to Leban Bayou	Ephemeral
Unnamed Drainage Ditch	From Crenshaw POTW (MS0026930) to David Bayou	Ephemeral
Unnamed Drainage Ditch (Hollandale)	From Farm Fresh Catfish POTW (MS0039535) to Black Bayou	Ephemeral
Unnamed Drainage Ditch	From Farrell to POTW (MS0045187) Overcup Slough	Ephemeral
Unnamed Drainage Ditch	From Lambert POTW (MS0020231) to Muddy Bayou	Ephemeral

<b>Yazoo River Basin Continued</b>		
<b>Waters</b>	<b>Location</b>	<b>Classification</b>
Unnamed Drainage Ditch	From Leland POTW (MS0020761) to Black Bayou	Ephemeral
Unnamed Drainage Ditch	From Lurand Utility District (MS0045080) to the Big Sunflower River	Ephemeral
Unnamed Drainage Ditch	From Rolling Fork POTW (East Lagoon) (MS0025585) to the Little Sunflower River	Ephemeral
Unnamed Drainage Ditch	From Rolling Fork POTW (West Lagoon) (MS0025593) to Indian Bayou	Ephemeral
Unnamed Drainage Ditch	From Ruleville POTW (MS0024945) to the Quiver River	Ephemeral
Unnamed Drainage Ditch	From Shaw POTW (MS0024953) to Porter Bayou	Ephemeral
Unnamed Drainage Ditch	From Shelby POTW (MS0025089) to Mound Bayou	Ephemeral
Unnamed Drainage Ditch	From Simmons Farm Raised Catfish (Yazoo County) (MS0039403) to Unnamed Tributary of Lake George	Ephemeral
Unnamed Drainage Ditch	From Sledge POTW (MS0021016) to David Bayou	Ephemeral
Unnamed Drainage Ditch	From Tunica POTW (MS0042323) Unnamed Tributary of White Oak Bayou	Ephemeral
Unnamed Drainage Ditch	From Winstonville POTW (MS0026450) to the ephemeral ditch west of Winstonville	Ephemeral
Wall Doxey State Park Reservoir (Spring Lake)	Marshall County	Recreation



Source Miss. Code Ann. §§ 49-2-9, 49-17-17, 49-2-1, *et seq.* and 49-17-1, *et seq.*