Alabama Department of Environmental Management

Alabama's Water Quality Assessment and Listing Methodology

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List of Acronyms

A&I	Agriculture and Industry water supply use classification
ADB	Assessment Database
ADEM	Alabama Department of Environmental Management
ADPH	Alabama Department of Public Health
AEMC	Alabama Environmental Management Commission
AWIC	Alabama Water Improvement Commission
$CaCO_3$	Calcium Carbonate
$CBOD_5$	Five-Day Carbonaceous Biochemical Oxygen Demand
Cl^{-1}	Chlorides
CWA	Clean Water Act
DO	Dissolved Oxygen
DBP	Disinfection By Products
DRP	Dissolved Reactive Phosphorus
EPA	Environmental Protection Agency
EPT	Ephemeroptera/Plecoptera/Trichoptera
F&W	Fish and Wildlife
GIS	Geographical Information System
GPS	Global Positioning System
IBI	Index of Biotic Integrity
LWF	Limited Warmwater Fishery
MPL	Most Probable Number
MDL	Method Detection Limit
NH3-N	Ammonia Nitrogen
NHD	National Hydrography Dataset
NO3+ NO2-N	Nitrate + Nitrite Nitrogen
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
OAW	Outstanding Alabama Waters
ONRW	Outstanding National Resource Water
PWS	Public Water Supply
QAPP	Quality Assurance Project Plan
S	Swimming and Other Whole Body Water-Contact Sports
SH	Shellfish Harvesting
SOP/QCA	Standard Operating Procedures/Quality Control Assurance
SW	Surface Water
TAL	Treasured Alabama Lake
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
Total-P	Total Phosphorus
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WMB-EPT	Wadeable Multi-habitat Bioassessment - EPT Families
WMB-I	Intensive Wadeable Multi-habitat Bioassessment

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1.0 ***Introduction***

Alabama has long been recognized for its abundant water resources. With over 77,000 miles of perennial and intermittent streams and rivers, 481,757 acres of publicly-owned lakes and reservoirs, 610 square miles of estuaries, and 50 miles of coastal shoreline, the state is faced with a tremendous challenge to monitor and accurately report on the condition of its surface waters (ADEM, 2004).

Sections 305(b) and 303(d) of the federal Clean Water Act directs states to monitor and report the condition of their water resources. Recent guidance published by the Environmental Protection Agency (EPA) provides a basic framework that states may use to fulfill this reporting requirement. *Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act* provides recommendations on the delineation of assessment units, reporting the status and progress towards comprehensive assessment of state waters, attainment of state water quality standards and the basis for making attainment decisions, schedules for additional monitoring, listing waters which do not fully support their designated uses (i.e. impaired waters), and schedules to address impaired waters (EPA, 2005).

Alabama's assessment and listing methodology establishes a process, consistent with EPA's guidance, to assess the status of surface waters in Alabama relative to the designated uses assigned to each waterbody. The methodology will also describe the procedure to assign the size or extent of assessed waterbodies. This methodology is not intended to limit the data or information that the State considers as it prepares an integrated water quality assessment report. Rather, it is intended to establish a rational and consistent process for reporting the status of Alabama's surface waters relative to their designated uses.

2.0 ***Alabama's Water Quality Standards***

State water quality standards are the yardstick by which the condition of the nation's waters is measured. They are intended to protect, restore and maintain the condition of the nation's waters. In Alabama, the Alabama Water Improvement Commission (AWIC) first adopted water quality standards in 1967. In 1982, the Alabama Department of Environmental Management (ADEM) was formed by merging AWIC with elements of the Alabama Department of Public Health (ADPH). Since first being adopted in 1967, Alabama's water quality standards have been amended on numerous occasions (ADEM, 2010).

The Alabama Environmental Management Commission (AEMC) has the authority to adopt revisions to the ADEM Administrative Code. The Designated Uses (Chapter 335-6-11 of the Administrative Code) and the Water Quality Criteria (Chapter 335-6-10 of the Administrative Code) are reviewed once every three years pursuant to EPA regulations at 40 CFR Part 131.20. Known as the triennial review, this process affords the public the opportunity to make comments and suggestions regarding Alabama's water quality standards. Any changes that ADEM may propose because of the review process are subject to further public comment before consideration by the AEMC.

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Water quality standards consist of three components: designated uses, numeric and narrative criteria, and an antidegradation policy. These three components have been compared to the three legs of a stool which work together to provide water quality protection for the nation's surface waters.

Designated uses describe the best uses reasonably expected of waters. These uses should include such activities as recreation in and on the water, public water supply, agricultural and industrial water supply, and habitat for fish and wildlife. While not all waters may support all of these uses, the goal of the Clean Water Act is to provide protection of water quality consistent with "fishable/swimmable" uses, where attainable. In Alabama, waters can be assigned one or more of seven designated uses pursuant to ADEM Administrative Code 335-6-11. These uses include:

1. Outstanding Alabama Water (OAW)
2. Public Water Supply (PWS)
3. Shellfish Harvesting (SH)
4. Swimming and Other Whole Body Water-Contact Sports (S)
5. Fish and Wildlife (F&W)
6. Limited Warmwater Fishery (LWF)
7. Agricultural and Industrial Water Supply (A&I)

Designated uses 1 through 5 in the list above are considered by EPA to be consistent with the "fishable/swimmable" goal and, therefore, provide for protection of aquatic life and human health.

The State also has two special designations – Outstanding National Resource Water (ONRW) and Treasured Alabama Lake (TAL). These high quality waters are protected or require a thorough evaluation of discharges from new or expanded point sources of pollutants and may be assigned to any one of the first five designated uses in the list above.

Numeric and narrative criteria provide the means to measure the degree to which the quality of waters is consistent with their designated use or uses. The criteria are intended to provide protection of the water quality commensurate with the water's use, to including protection of human health. Narrative criteria generally describe minimum conditions necessary for all uses and may include certain restrictions for specific uses. Numeric criteria include pollutant concentrations or physical characteristics necessary to protect a specific designated use. Alabama's narrative and numeric criteria are defined in ADEM Administrative Code 335-6-10.

The state's antidegradation policy provides for the protection of high quality waters that constitute an outstanding national resource (Tier 3), waters whose quality exceeds the levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water (Tier 2), and existing instream water uses and the level of water quality necessary to protect the existing uses (Tier 1). In Tier 3 waters, ADEM Administrative Code 335-6-10-.10 prohibits new or expanded point source discharges. In Tier 2 waters, ADEM Administrative Code 335-6-10-.04 provides for new or expanded discharge of pollutants only after intergovernmental coordination, public participation, and a demonstration that the new or expanded discharge is necessary for important economic or social development. Alabama's water quality standards regulations (ADEM Administrative Code 335-6-10 and 335-6-11) may be found at the Departments web page at:
http://www.adem.state.al.us/alEnviroRegLaws/files/Division6Vol1.pdf

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3.0 ***Waterbody Categorization***

The water quality assessment process begins with the collection, compilation, and evaluation of water quality data and information for the purpose of determining if a waterbody is supporting all of its designated uses. It is imperative that the data and information used in the process be of adequate quality and provides an accurate indication of the water quality conditions in the waterbody since decisions arising from the assessment process may have long-term consequences. Issues of data sufficiency and data quality must be addressed to ensure that use support decisions are based on accurate data and information. However, the minimum data requirements discussed in this methodology are not intended to exclude data and information from the assessment process but are a guide for use in designing monitoring activities to assess the State's surface waters and to ensure that decisions are made using the best available data. The goal is to accurately describe the status of surface waters where possible and to identify waters where more information is needed to make use support decisions.

The use support assessment process considers all existing and readily available data and information with a goal of placing waterbodies in one of five separate categories. This process is specific to the highest designated use assigned to the waterbody and is described by the flow chart depicted in **Figure 1**.

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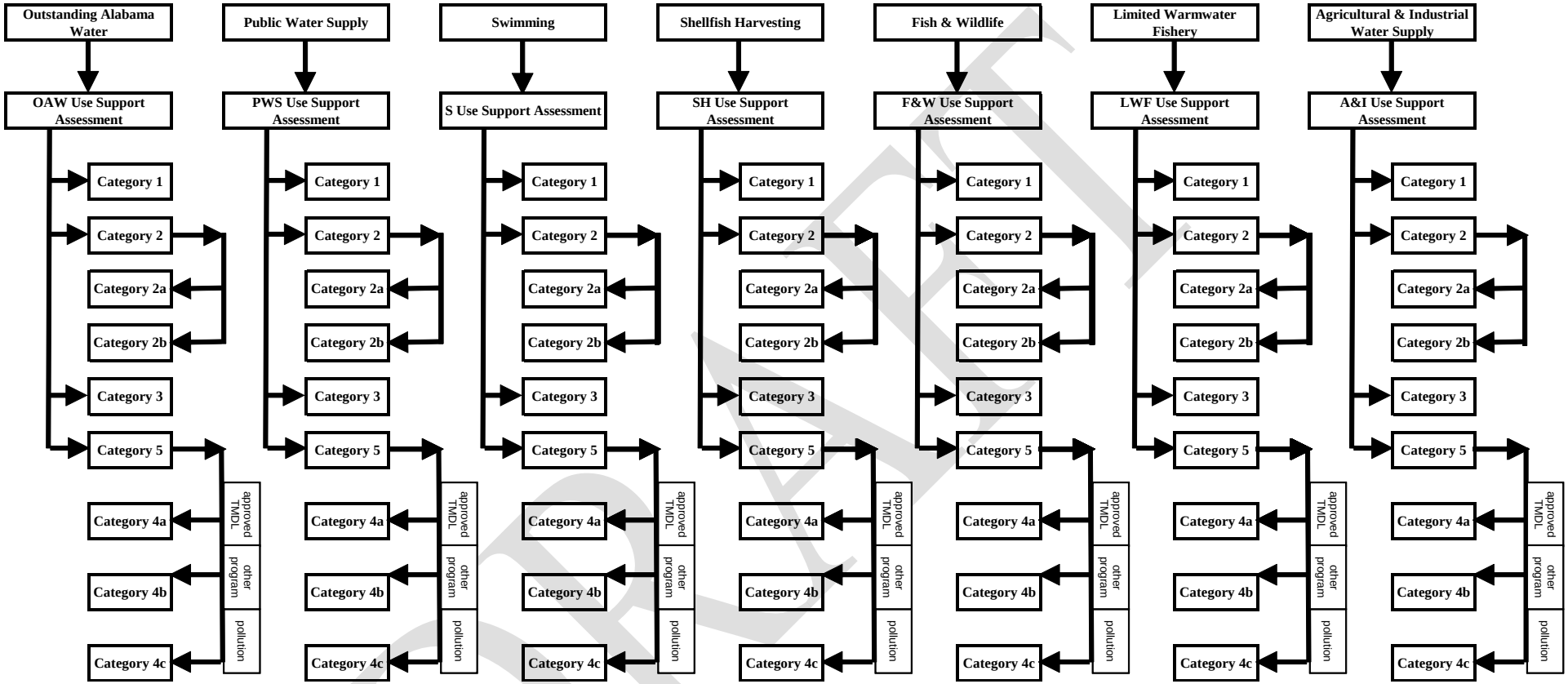
Figure 1
Alabama's Waterbody Assessment Process



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Waterbody data and information are evaluated using the use support assessment methodology and the waterbody is assigned to one of the following categories.

Category 1
Waters that are attaining all applicable water quality standards.

Category 2
Waters for which existing and readily available data, which meets the State's requirements as described in Section 4.9, supports a determination that some water quality standards are met and there is insufficient data to determine if remaining water quality standards are met. Attainment status of the remaining standards is unknown because data is insufficient. Waters for which the minimum data requirements (as described later) have not been met will be placed in Category 2.

1. *Category 2A*
   For these waters, available data does not satisfy minimum data requirements but there is a high potential for use impairment based on the limited data. These waters will be given a higher priority for additional data collection.

2. *Category 2B*
   For these waters available data does not satisfy minimum data requirements but there is a low potential for use impairment based on the limited data. These waters will be included in future basin monitoring rotations as resources allow.

Category 3
Waters for which there is no data or information to determine if any applicable water quality standard is attained or impaired. These waters will be considered unassessed.

Category 4
Waters in which one or more applicable water quality standards are not met but establishment of a TMDL is not required.

1. *Category 4A*
   Waters for which all TMDLs needed to result in attainment of all applicable WQSs have been approved or established by EPA.
2. *Category 4B*
   Waters for which other required control measures are expected to attain applicable water quality standards in a reasonable time. Adequate documentation is required to indicate that the proposed control mechanisms will address all major pollutant sources and should result in the issuance of more stringent effluent limitations required by either Federal, State, or local authority or the implementation of "other pollution control requirements (e.g., best management practices) required by local, state, or federal authority" that are stringent enough to implement applicable water quality standards. Waters will be evaluated on a -case-by-case basis to determine if the proposed control measures or activities under another program can be expected to address the cause of use impairment within a reasonable time. A reasonable time may vary depending on the degree of technical difficulty or extent of the modifications to existing measures needed to achieve water quality standards. EPA's 2006 assessment and listing guidance

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offers additional clarification of what might be expected of waters placed in Category 4b.

3. *Category 4C*
   Waters in which the impairment is not caused by a pollutant. This would include waters, which are impaired due to natural causes or pollution. A pollutant is defined in Section 502(6) of the Clean Water Act (CWA) as "spoil, solid waste, incinerator residue, sewerage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste discharged into water." Pollution is defined as "the man-made or man-induced alteration of the chemical, physical, or radiological integrity of a waterbody." Invasive plants and animal species are considered pollution.

Category 5
Waters in which a pollutant has caused or is suspected of causing impairment. If an identified pollutant causes the impairment, the water should be placed in Category 5. All "existing and readily available data and information" will be used to determine when a water should be placed in Category 5. Waters in this category comprise the State's list of impaired waters or §303(d) list.

When the information used to assess the waterbody consist primarily of observed conditions, (limited water quality data, water quality data older than six years, or estimated impacts from observed or suspected activities), the assessment is generally referred to as an evaluated assessment (Category 2). Evaluated assessments usually require the use of some degree of professional judgment by the person making the assessment and these assessments are not considered sufficient to place waters in or to remove waters from the impaired category (Category 5) or the fully supporting category (Category 1).

Monitored assessments (Categories 1 and 5) are based on existing and readily available chemical, physical, and/or biological data collected during the previous six years, using commonly accepted and well-documented methods. Existing and readily available data are data that have been collected or assembled by the Department or other groups or agencies and are available to the public. Data older than six years old may be used on a case-by-case basis when assessing waters that are not currently included in Category 1 or Category 5. (For example, older data could be used if conditions, such as land use, have not changed.) Much of the remainder of this document will pertain to the use of monitoring data to make use support determinations.

4.0 ***The Water Quality Assessment Process***

The water quality assessment process is different for each of Alabama's seven designated uses because each use is protected by specific numeric and narrative water quality criteria. As such, the methodology for assigning a given waterbody to one of the five categories may have different data requirements and thresholds for determining the waterbody's use support status. In addition, interpretation of narrative criteria may differ by classified use and waterbody type. Data and information that may be considered when assessing state waters could include water chemistry data such as chemical specific concentration data, land use or land cover data, physical

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data such as water temperature, and conductivity, and habitat evaluations; biological data such as macroinvertebrate and fish community assessments, and bacteriological data such as E. coli or enterococci counts. Waters classified as "Fish and Wildlife" or higher must provide protection of the aquatic life use. All classifications must provide protection of the human health use.

Alabama's designated uses embody a tiered approach to aquatic life protection. The assessment process recognizes this by allowing for different minimum data requirements and varying criteria exceedance thresholds. For example, in waters classified as OAW, Alabama's highest designated use, the assessment methodology requires less data and allows for fewer exceedances of a toxic criterion to be considered for inclusion in Category 5. The assessment process for waters classified as A&I, Alabama's lowest designated use, require more data and allows for slightly more exceedances of toxic criteria. This sliding scale assessment approach provides for existing differences in the aquatic communities and habitat conditions represented by streams with Alabama's various designated uses.

In order to ensure consistent and accurate assessment of a waterbody's support status and proper categorization of the waterbody, minimum data requirements must be defined that address data quality and data quantity. Data requirements will not only be dictated by the classified use of the waterbody but also by the waterbody type to account for the different monitoring strategies that may be used for different waterbody types. The minimum data requirements are expected to guide future water quality monitoring activities and provide the basis for making use support decisions. However, in those cases where a data set may not include all of the elements specified by the minimum data requirements, a decision to include the water in Category 5 can still be made provided the available data indicates a clear impairment and the cause of the impairment is evident. These decisions will be made on a case-by-case basis and the decision will be documented in the ADB.

In the assessment methodology, the terms "Level IV WMB-I", "Level III WMB-EPT", "Fish IBI", "habitat assessment", "conventional parameter samples", "pesticide/herbicide samples", "inorganic samples", "chlorophyll *a* samples", and "fish tissue analysis" are used. For the purposes of this assessment methodology, these terms will have the following meanings.

Level IV WMB-I:

- An intensive multi-habitat assessment of the macroinvertebrate community in a wadeable stream involving the collection of macroinvertebrates for identification and enumeration in a laboratory

Level III WMB-EPT:

- A screening-level multi-habitat assessment of the macroinvertebrate community in a stream focusing on the collection, field processing and enumeration of the pollution-sensitive Ephemeroptera, Plecoptera, and Trichoptera taxa

Fish IBI:

- A multihabitat fish community assessment method developed by the Geological Survey of Alabama (O'Neil et al. 2006) and described in ADEM SOP # 6100 for streams in the southern plains (O'Neil and Shepard 2009), Tennessee Valley (O'Neil and Shepard 2010),

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and Ridge and Valley/Piedmont (O'Neil and Shepard 2011) ichthyoregions (O'Neil and Shepard 2007).

Habitat assessment:

- An assessment of available aquatic habitat in a stream which considers habitat characteristics important to supporting a diverse and healthy aquatic community

Conventional parameter samples will include analyses for the following constituents:

- Collector Name
- Date (Month, Day, Year)
- Time (24 hr)
- Air Temperature, °C
- Water Temperature, °C
- Total Stream Depth at Sampling Point, ft. or m
- Sample Collection Depth, ft. or m
- Dissolved Oxygen (DO), mg/l
- Conductivity, µmhos/cm @ 25C
- Salinity, ppt (coastal waters only)
- pH, s.u.
- Turbidity, NTU
- Weather Conditions
- Stream Flow (where appropriate)
- Five-day Carbonaceous Biochemical Oxygen Demand (CBOD5), mg/l
- Alkalinity, mg/l
- Total Suspended Solids (TSS), mg/l
- Total Dissolved Solids (TDS), mg/l
- Dissolved Reactive Phosphorus (DRP), mg/l (field filtered, separate bottle)
- Ammonia Nitrogen (NH3-N), mg/l
- Nitrate + Nitrite Nitrogen (NO3+ NO2-N), mg/l
- Total Kjeldahl Nitrogen (TKN), mg/l
- Total Phosphorus (Total-P), mg/l
- Hardness, mg/l

Pesticide/Herbicide samples will include analyses for the following constituents:

- Organochlorine Pesticides by method SW8081A
- Organophosphorus Pesticides by method SW8141
- Chlorinated Herbicides by method SW8151
- Atrazine by Immunoassay

Inorganic (metals) samples will include analyses for the following constituents:

- "Total" Aluminum (Al), ug/l
- "Dissolved" Aluminum (Al), ug/l
- "Dissolved" Antimony (Sb), ug/l
- "Dissolved" Arsenic^{+3} (As^{+3}), ug/l

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- "Dissolved" Cadmium (Cd), ug/l
- "Dissolved" Chromium^{+3} (Cr^{+3}), ug/l
- "Dissolved" Copper (Cu), ug/l
- "Total" Iron (Fe), ug/l
- "Dissolved" Iron (Fe), ug/l
- "Dissolved Lead (Pb), ug/l
- "Total" Manganese (Mn), ug/l
- "Dissolved" Manganese (Mn), ug/l
- "Total" Mercury (Hg), ug/l
- "Dissolved" Nickel (Ni), ug/l
- "Total" Selenium (Se), ug/l
- "Dissolved" Selenium (Se), ug/l
- "Dissolved" Silver (Ag), ug/l
- "Dissolved" Thallium (Tl), ug/l
- "Dissolved" Zinc (Zn), ug/l

Bacteriological Samples

- E. coli, colonies/100 ml in non-coastal waters
- Fecal coliform, colonies/100 ml in Shellfish Harvesting waters
- Enterococci, colonies/100 ml in coastal waters

Chlorophyll *a* samples will include the collection of photic zone composite water samples to be processed in accordance with ADEM SOP # 2063 Chlorophyll *a* Collection and Processing.

Fish tissue analysis will include collection and analyses of fish for the following constituents:

- Arsenic
- Cadmium
- Mercury
- Selenium
- Lead
- Chlordane
- 4,4-DDD
- 4,4-DDE
- 4,4-DDT
- 2,4-DDD
- 2,4-DDE
- 2,4-DDT
- Chlorpyrifos
- Dieldrin
- Endosulfan I
- Endosulfan II
- Endrin
- Lindane
- Heptachlor
- Heptachlor Epoxide
- Hexachlorobenzene
- Mirex
- Toxaphene
- PCBs
- Dioxin
- Percent lipids

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Fish sampling and tissue preparation procedures are described in SOP #2300 Fish Tissue Monitoring Sample Collection and ADEM SOP #2301 Fish Tissue Monitoring Sample, Processing and Data Reporting Procedures

Chronic aquatic life criteria will be used to assess a waterbody's use support where the designated use specifies such criteria. In those cases where both human health criteria and chronic aquatic life criteria are included, the more stringent of the criteria will determine the waterbody's use support status. The assessment process, including minimum data requirements and the number of chronic criteria exceedances, is described for each designated use in the remainder of the document.

4.1 *Outstanding Alabama Waters (OAW)*

The best usage of waters assigned this classification are those activities consistent with the natural characteristics of the waters. Waterbodies assigned the OAW use are high quality waters that constitute an outstanding Alabama resource, such as waters of state parks and wildlife refuges and waters of exceptional recreational or ecological significance. Beneficial uses encompassed within this classification include: aquatic life support and wildlife propagation, fish and shellfish harvesting and consumption, water contact recreation, agricultural irrigation, livestock watering and industrial cooling and process water supply.

4.1.1 *Minimum Data Requirement for OAW Waters*

For waters with the OAW classification the available data must have been collected consistent with the following standard operating procedures (SOP) manuals:

SOP#	Title
2040	Stream Flow Abbreviated Measurement Method
2041(a)	Temperature Field Measurements
2044	Turbidity Field Measurements
2046	Photic Zone Measurements and Visibility Determinations
2047	*In-situ* surface water quality Field measurements by Datasonde
2048	Continuous SW Quality Monitoring Using Datasondes
2061	General SW Quality Sample Collection
2062	Dissolved Reactive Phosphorus (DRP) Collection & Field Processing
2063	Water Column Chlorophyll *a* Sample Collection
2064	Surface Water Sample Collection of Bacteria Samples
2065	Sediment Sample Collection
2066	Dissolved Metals Sample Collection and Processing
2067	Organic Sample Collection
5700	Algal Growth Potential Testing (AGPT)
6000	Macroinvertebrate Sample Collection
6001	Macroinvertebrate Sample Processing
6002	Macroinvertebrate Organism Identification
6004	Macroinvertebrate Sample Data Analysis
6100	Fish Index of Biotic Integrity Sample Collection Procedure for Wadeable Streams

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SOP#	Title
6300	Physical Characterization
6301	Habitat Assessment
9021	Field Quality Control Measurements and Samples
9025	Field Equipment Cleaning and Storage Procedures
9040	Station, Sample ID & Chain of Custody Procedures

In addition, the data must have been collected within the last six years. The six-year timeframe would capture all data collected by ADEM during one complete rotation of the five-year monitoring schedule currently used by the Department. Failure to satisfy both of these conditions places the waterbody in Category 2. If these two conditions are met, the determination of the minimum data requirement is dependent upon the waterbody type. Waterbody types include wadeable rivers and streams, non-wadeable rivers and streams, reservoirs and reservoir embayments, and estuary and coastal waters. In addition, the minimum data requirement may change if pollutant sources upstream of the monitoring location are likely. Failure to meet the minimum data requirement for any waterbody type will place the waterbody in Category 2. The following list and **Figure 2** describe the minimum data requirements for assessing waters classified as OAW.

- Wadeable River or Stream
  - 1 Level IV Intensive Wadeable Multi-habitat Bioassessment (WMB-I) or 1 Level III Wadeable Multi-habitat Bioassessments – EPT Families (WMB-EPT) or 1 Level III WMB-EPT plus 1 fish community assessment (IBI). In addition, a habitat assessment must be completed with each biological assessment. Currently, metrics for the fish IBI have been calibrated only in the Black Warrior and Cahaba River basins.
  - 3 conventional parameter samples (including samples for nutrient analysis)
  - 3 bacteriological samples
  - 3 pesticide / herbicide samples
  - 3 inorganic samples

- Non-wadeable River or Stream
  - 8 conventional parameter samples (including samples for nutrient analysis)
  - 5 bacteriological samples (1 geometric mean)
  - 3 pesticide / herbicide samples
  - 3 inorganic samples

- Reservoirs and Embayments
  - 8 conventional parameter samples (including samples for nutrient analysis)
  - 3 bacteriological samples
  - 1 fish tissue analysis from the reservoir mainstem

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- 7 chlorophyll *a* samples collected between April and October (For the Tennessee River Basin: 6 chlorophyll *a* samples collected between April and September). Results from critical period sampling (i.e., August sample only) will be used with other critical period data to evaluate chlorophyll *a* trends at a given sampling location.

- Estuary or Coastal Waters
  - 8 conventional parameter samples (including samples for nutrient analysis)
  - 10 bacteriological samples (2 geometric means)
  - 1 fish tissue analysis

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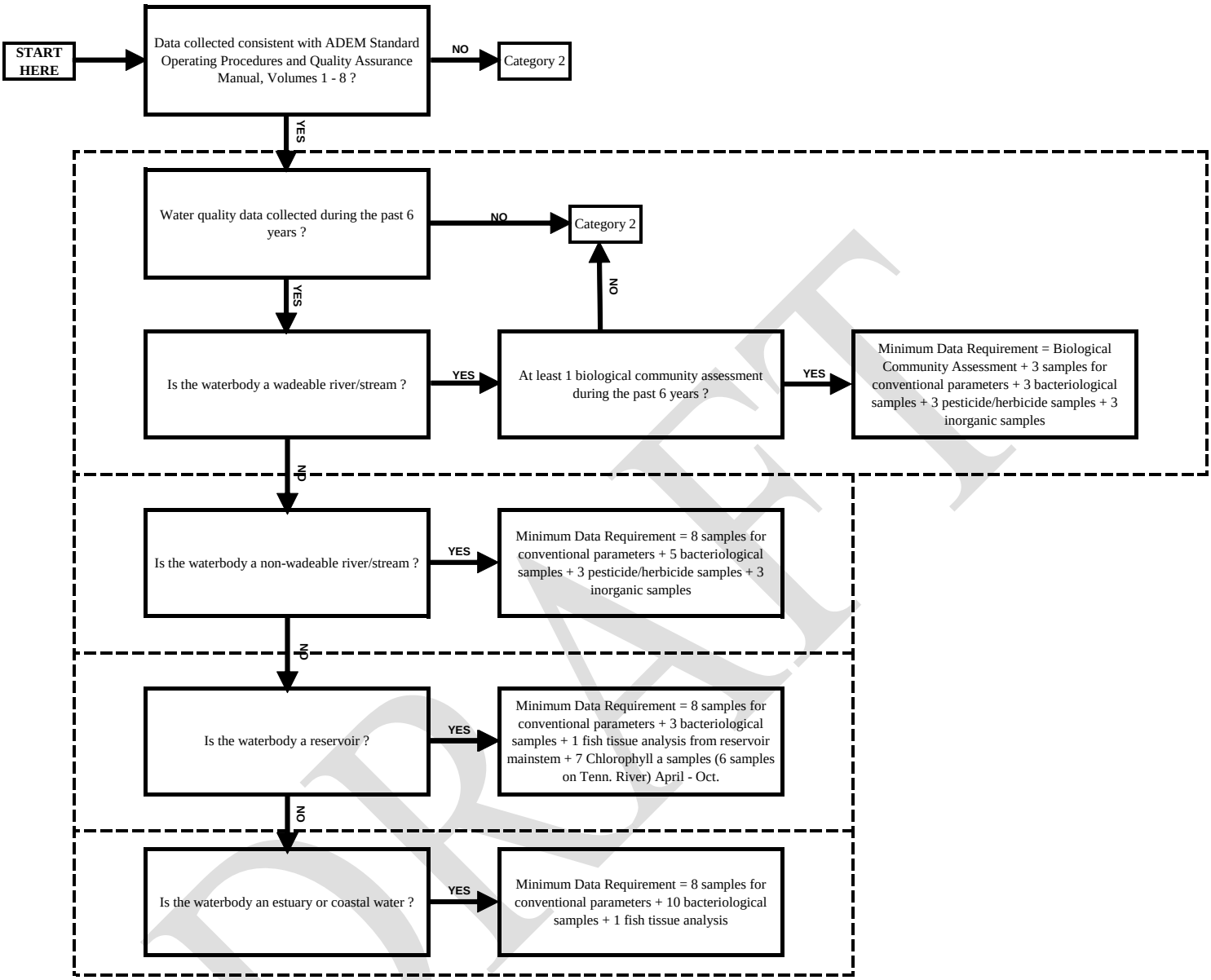
Figure 2
Minimum Data Requirements for the OAW Designated Use



Biological community assessment means:
1 Level IV Intensive Wadeable Multi-habitat Bioassessment (WMB-I) or
1 Level III Wadeable Multi-habitat Bioassessment – EPT Families (WMB-EPT) or
Level III WMB-EPT plus 1 fish community assessment (IBI)

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4.1.2 *Use Support Assessment for OAW Waters*

Once the minimum data requirements have been met an assessment of the data can be completed resulting in the categorization of the waterbody as either fully supporting the OAW use (Category 1) or not fully supporting the OAW use (Category 5). The assessment process considers the available data and may include any fish consumption advisories, shellfish harvesting closure notices, chemical specific data, bacteriological data, biological community assessments, habitat assessments, periphyton assessments, and toxicity evaluations. **Figure 3** illustrates the assessment process for OAW waters.

The OAW waterbody can be placed in Category 1 if all the following are true:	
Issue	**Condition**
Consumption Advisories	No fish/shellfish consumption advisory issued by the Alabama Department of Public Health (ADPH).
Macroinvertebrate and Fish Assessments	Level IV WMB-I assessment "good" or "excellent", or;[1] Level III WMB-EPT assessment "good" or "excellent", or;[1] Level III WMB-EBT assessment "good" or "excellent", and fish IBI "fair", "good", or "excellent".[1]
Chlorophyll *a* Data	Growing season mean chlorophyll *a* criterion has not been exceeded where such a criterion has been established.[2]
Toxic Pollutants	There is an exceedance of any toxic pollutant criterion for other than natural conditions in the previous six years.
Conventional Parameters[3]	No exceedance of conventional parameters, except due to natural conditions.[4]
Bacteriological Data	**Non-Coastal Waters:** **A.** A single sample result greater than 235 colonies/100 ml E. coli will require a follow-up geometric mean sampling event. The geometric mean E. coli density must be less than or equal to 126 colonies/100 ml, or; **B.** 10% or less of single samples must be less than or equal to 235 colonies/100 ml.[4]
	Coastal Waters: **A.** A single sample result greater than 104 colonies/100 ml enterococci will require a follow-up geometric mean sampling event. The geometric mean enterococci density must be less than or equal to 35 colonies/100 ml, or;

[1] Applicable to wadeable streams only.
[2] Chlorophyll *a* values in excess of the criterion, due to extreme hydrological events (i.e. drought, floods), will not be considered as an exceedance of the criterion. Extreme drought conditions are droughts with a drought intensity category of D2 or greater as listed in the U.S. Drought Monitor (http://droughtmonitor.unl.edu/) that persists for 50% or more of the growing season. Extreme flood conditions are streamflows greater than the 75th percentile streamflow based on period of record caused by events such as tropical storms, hurricanes, and unusually intense storm activity.
[3] Conventional parameters include DO, pH, temperature (where influenced by heated discharge), and turbidity.
[4] As determined by the binomial distribution function and Table 2.

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	B. 10% or less of single samples must be less than or equal to 104 colonies/100 ml.[4]

The OAW waterbody can be placed in Category 5 if any of the following are true:	
Issue	**Condition**
Consumption Advisories	Fish consumption advisory has been issued by the Alabama Department of Public Health (ADPH).
Macroinvertebrate and Fish Assessments	Level IV WMB-I assessment less than "good", or;[5] Level III WMB-EPT assessment less than "good", or;[5] Level III WMB-EPT assessment less than "good", and fish IBI less than "fair".[5]
Chlorophyll *a* Data	Growing season mean chlorophyll *a* criterion has been exceeded where such a criterion has been established.[6]
Toxic Pollutants	There is an exceedance of any toxic pollutant criterion for other than natural conditions in the previous six years.
Conventional Parameters[7]	There is an exceedance of conventional parameter for other than natural conditions.[8]
Bacteriological Data	**Non-Coastal Waters:** **A.** A single sample result greater than 235 colonies/100 ml E. coli will require a follow-up geometric mean sampling event. The geometric mean E. coli density is greater than 126 colonies/100 ml, or; **B.** More than 10% of single samples are greater than 235 colonies/100 ml.[8]
	Coastal Waters: **A.** A single sample result greater than 104 colonies/100 ml enterococci will require a follow-up geometric mean sampling event. The geometric mean enterococci density is greater than 35 colonies/100 ml, or; **B.** More than 10% of single samples are greater than 104 colonies/100 ml.[8]

[5] Applicable to wadeable streams only. A potential anthropogenic cause for the degraded condition must be identified.

[6] Chlorophyll *a* values in excess of the criterion, due to extreme hydrological events (i.e. drought, floods), will not be considered as an exceedance of the criterion. Extreme drought conditions are droughts with a drought intensity category of D2 or greater as listed in the U.S. Drought Monitor (http://droughtmonitor.unl.edu/) that persists for 50% or more of the growing season. Extreme flood conditions are streamflows greater than the 75th percentile streamflow based on period of record caused by events such as tropical storms, hurricanes, and unusually intense storm activity. When a growing season mean chlorophyll *a* value exceeds the criterion, the reservoir will be identified for re-sampling the following year and enough samples will be collected to ensure that the minimum data requirements necessary to calculate a growing season mean are met.

[7] Conventional parameters include DO, pH, temperature (where influenced by heated discharge), and turbidity.

[8] As determined by the binomial distribution function and Table 2.

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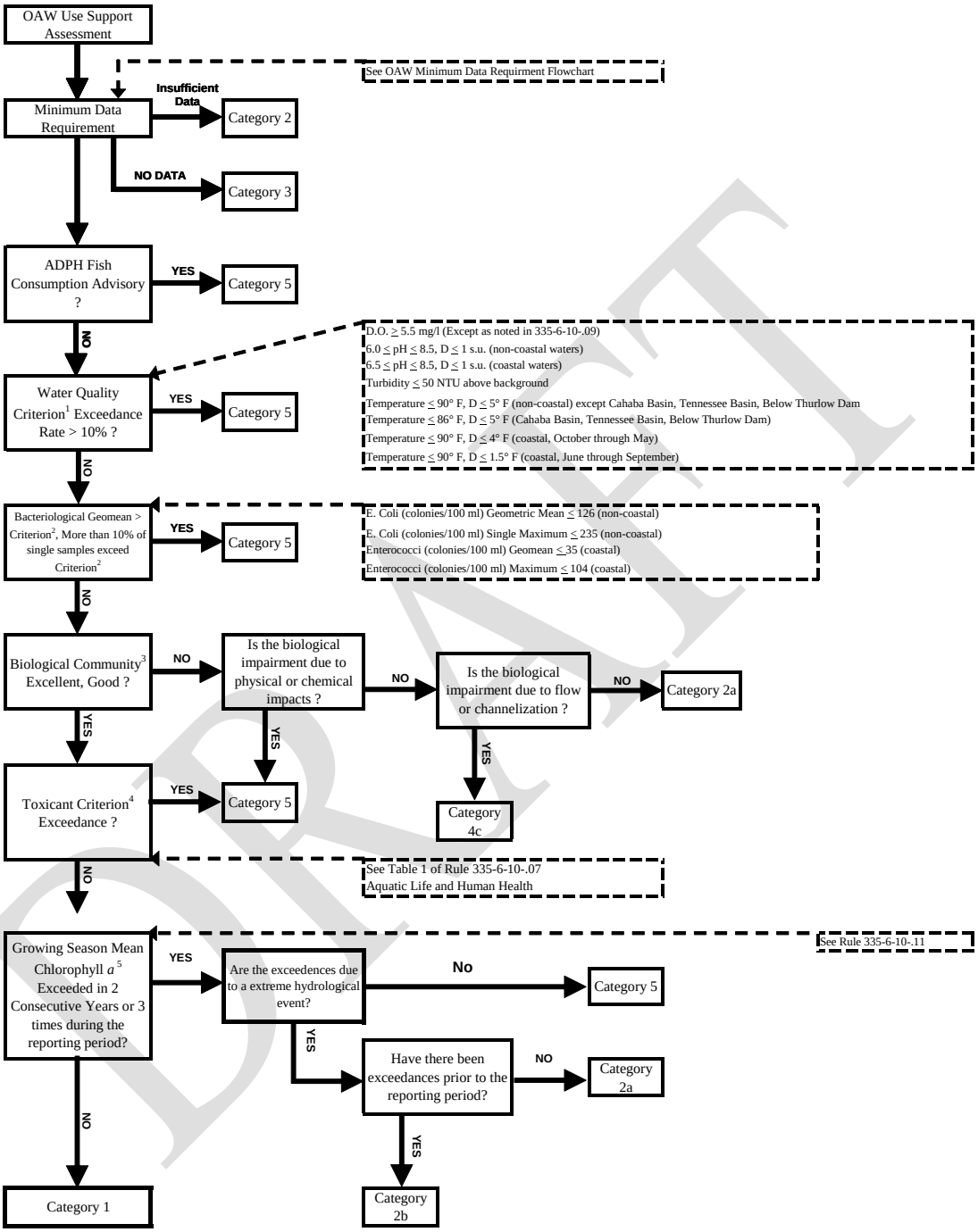
Figure 3
Outstanding Alabama Water (OAW) Assessment Methodology



1 Water Quality Criterion refers to pH, Dissolved Oxygen, turbidity, and temperature resulting from heat sources
2 Bacteriological Criterion refers to both the single sample maximum and geometric mean, see discussion in Section 4.1.2
3 Biological community refers to macroinvertebrates and/or fish in wadeable rivers/streams only (See Minimum Data Requirments)
4 Toxicant Criterion refers to toxics listed in 335-6-10-.07
5 Applies only to reservoirs with established Chlorophyll a criteria and not during extreme hydrologic events. Extreme drought conditions are droughts with a drought intensity category of D2 or greater as listed in the U.S. Drought Monitor (http://droughtmonitor.unl.edu/) that persists for 50% or more of the growing season. Extreme flood conditions are streamflows greater than the 75th percentile streamflow based on period of record caused by events such as tropical storms, hurricanes, and unusually intense storm activity.

Special Note - Natural waters may, on occasion, have characteristics outside of the limits established by these criteria. These criteria relate to condition of waters as affected by the discharge of sewage, industrial wastes, or other wastes, not to conditions resulting from natural forces. See 335-6-10-.05(4)

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4.2 *Public Water Supply (PWS)*

The best usage of waters assigned this classification is as a source of water supply for drinking or food-processing purposes after approved treatment. Waterbodies assigned the PWS use are considered safe for drinking or food-processing purposes if subjected to treatment approved by the Department equal to coagulation, sedimentation, filtration and disinfection, with additional treatment if necessary to remove naturally present impurities. Beneficial uses encompassed within this classification include: aquatic life support and wildlife propagation, fish and shellfish harvesting and consumption, drinking and food-processing water supply, water contact recreation, agricultural irrigation, livestock watering and industrial cooling and process water supply.

4.2.1 *Minimum Data Requirement for PWS Waters*

For waters with the PWS classification the available data must have been collected consistent with the following standard operating procedures (SOP) manuals:

SOP#	Title
2040	Stream Flow Abbreviated Measurement Method
2041(a)	Temperature Field Measurements
2044	Turbidity Field Measurements
2046	Photic Zone Measurements and Visibility Determinations
2047	*In-situ* surface water quality Field measurements by Datasonde
2048	Continuous SW Quality Monitoring Using Datasondes
2061	General SW Quality Sample Collection
2062	Dissolved Reactive Phosphorus (DRP) Collection & Field Processing
2063	Water Column Chlorophyll *a* Sample Collection
2064	Surface Water Sample Collection of Bacteria Samples
2065	Sediment Sample Collection
2066	Dissolved Metals Sample Collection and Processing
2067	Organic Sample Collection
5700	Algal Growth Potential Testing (AGPT)
6000	Macroinvertebrate Sample Collection
6001	Macroinvertebrate Sample Processing
6002	Macroinvertebrate Organism Identification
6004	Macroinvertebrate Sample Data Analysis
6100	Fish Index of Biotic Integrity Sample Collection Procedure for Wadeable Streams
6300	Physical Characterization
6301	Habitat Assessment
9021	Field Quality Control Measurements and Samples
9025	Field Equipment Cleaning and Storage Procedures
9040	Station, Sample ID & Chain of Custody Procedures

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In addition, the data must have been collected within the last six years. The six-year timeframe would capture all data collected by ADEM during one complete rotation of the five-year monitoring schedule currently used by the Department. Failure to satisfy both of these conditions places the waterbody in Category 2. If these two conditions are met, the determination of the minimum data requirement is dependent upon the waterbody type. Waterbody types include wadeable rivers and streams, non-wadeable rivers and streams, reservoirs and reservoir embayments, and estuary and coastal waters. Failure to meet the minimum data requirement will place the waterbody in Category 2. The following list and **Figure 4** describe the minimum data requirement for assessing waters classified as PWS.

- Wadeable River or Stream
    - 1 Level IV Intensive Wadeable Multi-habitat Bioassessment (WMB-I) or 2 Level III Wadeable Multi-habitat Bioassessments – EPT Families (WMB-EPT) or 1 Level III WMB-EPT plus 1 fish community assessment (IBI). In addition, a habitat assessment must be completed with each biological assessment. Currently, metrics for the fish IBI have been calibrated only in the Black Warrior and Cahaba River basins.
    - 3 conventional parameter samples (including samples for nutrient analysis)
    - 3 bacteriological samples

      OR

    - 8 conventional parameter samples (including samples for nutrient analysis)
    - 10 bacteriological samples (2 geometric mean samples)
    - 3 pesticide / herbicide samples
    - 3 inorganic samples

- Non-wadeable River or Stream
    - 8 conventional parameter samples (including samples for nutrient analysis)
    - 10 bacteriological samples (2 geometric mean samples)
    - 3 pesticide / herbicide samples
    - 3 inorganic samples

- Reservoirs and Embayments
    - 8 conventional parameter samples (including samples for nutrient analysis)
    - 3 bacteriological samples
    - 1 fish tissue analysis from the reservoir mainstem
    - 7 chlorophyll *a* samples collected between April and October (For the Tennessee River Basin: 6 chlorophyll *a* samples collected between April and September). Results from critical period sampling (i.e., August sample

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only) will be used with other critical period data to evaluate chlorophyll *a* trends at a given sampling location.

- Estuary or Coastal Waters
  - 8 conventional parameter samples (including samples for nutrient analysis)
  - 10 bacteriological samples (2 geometric mean samples)
  - 1 fish tissue analysis

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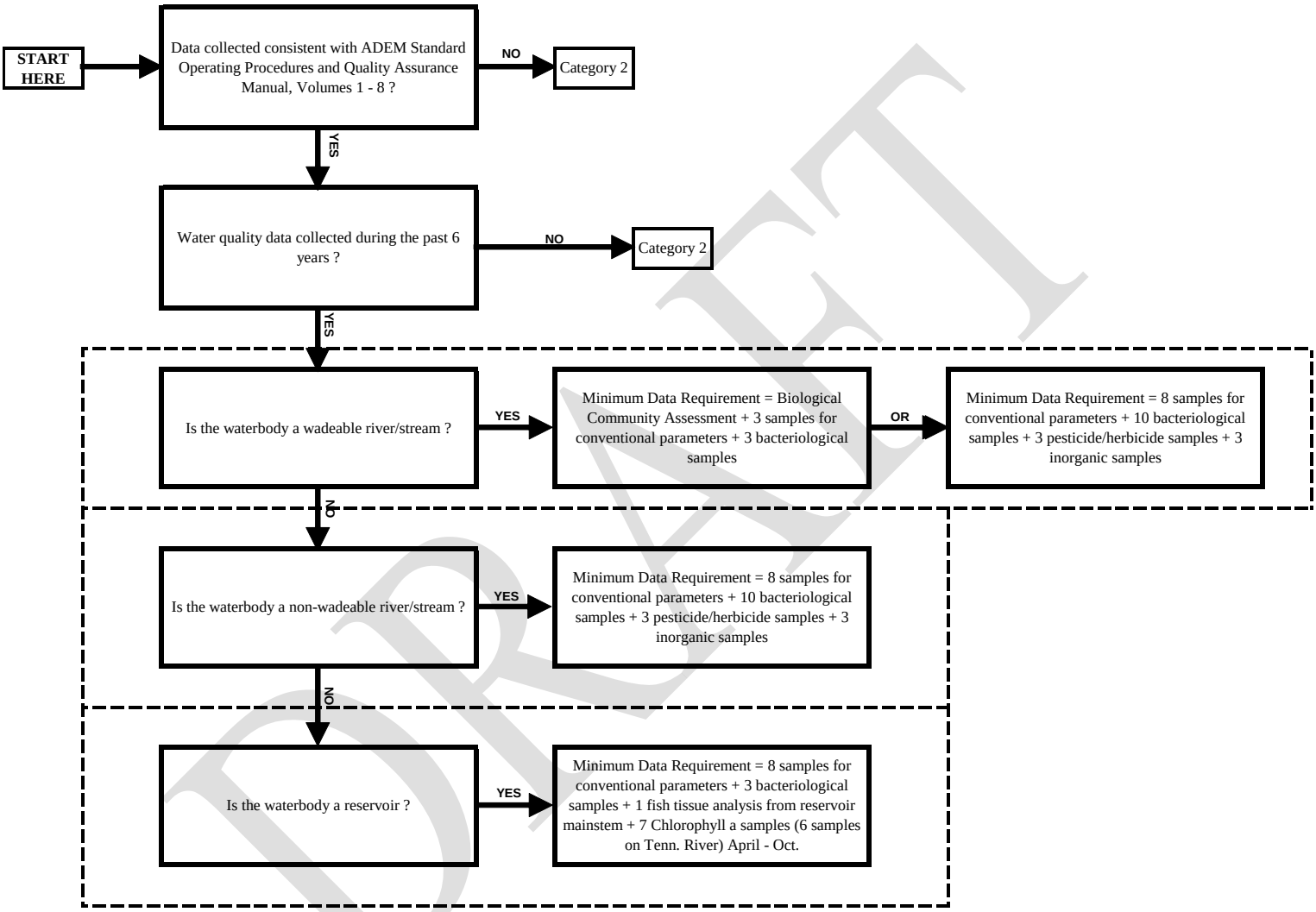
Figure 4
Minimum Data Requirements for the PWS Designated Use



Biological community assessment means:
1 Level IV Intensive Wadeable Multi-habitat Bioassessment (WMB-I) or
2 Level III Wadeable Multi-habitat Bioassessments – EPT Families (WMB-EPT) or
1 Level III WMB-EPT plus 1 fish community assessment (IBI)

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4.2.2 *Use Support Assessment for PWS Waters*

Once the minimum data requirement has been met an assessment of the data can be completed resulting in the categorization of the waterbody as either fully supporting the PWS use (Category 1) or not fully supporting the PWS use (Category 5). The assessment process considers the available data and may include any fish consumption advisories, shellfish harvesting closure notices, chemical specific data, bacteriological data, biological community assessments, habitat assessments, periphyton assessments, drinking water system compliance records, and toxicity evaluations. **Figure 5** illustrates the assessment process for PWS waters.

The PWS waterbody can be placed in Category 1 if all the following are true:	
Issue	**Condition**
Consumption Advisories	No fish/shellfish consumption advisories issued by the Alabama Department of Public Health (ADPH).
Macroinvertebrate and Fish Assessments	Level IV WMB-I assessment "fair", "good" or "excellent", or;[9] Either Level III WMB-EPT assessments "fair", "good", or "excellent", or;[9] Level III WMB-EPT assessment and fish IBI "fair", "good" or "excellent".[9]
Chlorophyll *a* Data	Growing season mean chlorophyll *a* criterion has not been exceeded in two consecutive years where such a criterion has been established unless a drinking water system withdrawing from a waterbody does not comply with a DBP requirement.[10]
Toxic Pollutants	No more than one exceedance of a particular toxic pollutant criterion in previous six years.
Conventional[11] Parameters	No more than a 10% exceedance rate for any given parameter.[12]
Bacteriological Data	**Non-Coastal Waters:** **A.** A single sample result greater than 487 colonies/100 ml E. coli (June – September) or greater than 2,507 colonies/100 ml E. coli (October – May) will require a follow-up geometric mean sampling event. The geometric mean E. coli density must be less than or equal to 126 colonies/100 ml (June – September) or less than or equal to 548 colonies/100 ml (October – May), or; **B.** 10% or less of single samples must be less than or equal to 487 colonies/100 ml (June – September) or less than or equal to 2,507 colonies/100 ml (October – May).[12]

[9] Applicable to wadeable streams only.
[10] Chlorophyll *a* values in excess of the criterion, due to extreme hydrological events (i.e. drought, floods), will not be considered as an exceedance of the criterion. Extreme drought conditions are droughts with a drought intensity category of D2 or greater as listed in the U.S. Drought Monitor (http://droughtmonitor.unl.edu/) that persists for 50% or more of the growing season. Extreme flood conditions are streamflows greater than the 75th percentile streamflow based on period of record caused by events such as tropical storms, hurricanes, and unusually intense storm activity.
[11] Conventional parameters include DO, pH, temperature (where influenced by heated discharge), and turbidity.
[12] As determined by the binomial distribution function and Table 2.

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The PWS waterbody can be placed in Category 1 if all the following are true:	
	Coastal Waters: **A.** A single sample result greater than 158 colonies/100 ml enterococci (June – September) or greater than 275 colonies/100 ml enterococci (October – May) will require a follow-up geometric mean sampling event. The geometric mean enterococci density must be less than or equal to 35 colonies/100 ml, or; **B.** 10% or less of single samples must be less than or equal to 158 colonies/100 ml (June – September) or less than or equal to 275 colonies/100 ml (October – May). [12]

The PWS waterbody can be placed in Category 5 if any of the following are true:	
Issue	**Condition**
Consumption Advisories	Fish consumption advisory issued by the Alabama Department of Public Health (ADPH).
Macroinvertebrate and Fish Assessments	Level IV WMB-I assessment less than "fair", or;[13] Either Level III WMB-EPT assessment less than "fair", or; [13] Level III WMB-EPT assessment and fish IBI less than "fair". [13]
Chlorophyll *a* Data	Growing season mean chlorophyll *a* criterion has been exceeded in two consecutive years or three times during the previous six years where such a criterion has been established or after one exceedance if a drinking water system is out of compliance with the DBP requirements.[14]
Toxic Pollutants	There is more than one exceedance of a particular toxic pollutant criterion in previous six years.
Conventional Parameters[15]	There is more than a 10% exceedance rate for any given parameter.[16]

[13] Applicable to wadeable streams only. A potential anthropogenic cause for the degraded condition must be identified using observations made during the sampling events or from information contained in the Department's geographic information system.

[14] Chlorophyll *a* values in excess of the criterion, due to extreme hydrological events (i.e. drought, floods), will not be considered as an exceedance of the criterion. Extreme drought conditions are droughts with a drought intensity category of D2 or greater as listed in the U.S. Drought Monitor (http://droughtmonitor.unl.edu/) that persists for 50% or more of the growing season. Extreme flood conditions are streamflows greater than the 75th percentile streamflow based on period of record caused by events such as tropical storms, hurricanes, and unusually intense storm activity. However, once exceedance of the criterion may be sufficient justification for inclusion of a water in Category 5 when the exceedance is determined to be a result of increasing nutrient loading from anthropogenic sources. These determinations will be made on a case-by-case basis and the decision will be documented in the ADB.ADB In any case, when a growing season mean chlorophyll *a* value exceeds the criterion, the reservoir will be identified for re-sampling the following year and enough samples will be collected to ensure that the minimum data requirements necessary to calculate a growing season mean are met.

[15] Conventional parameters include DO, pH, temperature (where influenced by heated discharge), and turbidity.

[16] As determined by the binomial distribution function and Table 2.

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The PWS waterbody can be placed in Category 5 if any of the following are true:	
Bacteriological Data	**<u>Non-Coastal Waters:</u>** ***A.*** A single sample result greater than 487 colonies/100 ml E. coli (June – September) or greater than 2,507 colonies/100 ml E. coli (October – May) will require a follow-up geometric mean sampling event. The geometric mean E. coli density is greater than 126 colonies/100 ml (June – September) or is greater than 548 colonies/100 ml (October – May), or; ***B.*** More than 10% of single samples are greater than 487 colonies/100 ml (June – September) or greater than 2,507 colonies/100 ml (October – May). [16]
	<u>Coastal Waters:</u> ***A.*** A single sample result greater than 158 colonies/100 ml enterococci (June – September) or greater than 275 colonies/100 ml enterococci (October – May) will require a follow-up geometric mean sampling event. The geometric mean enterococci density is greater than 35 colonies/100 ml, or; ***B.*** More than 10% of single samples are greater than 158 colonies/100 ml (June – September) or greater than 275 colonies/100 ml (October – May). [16]

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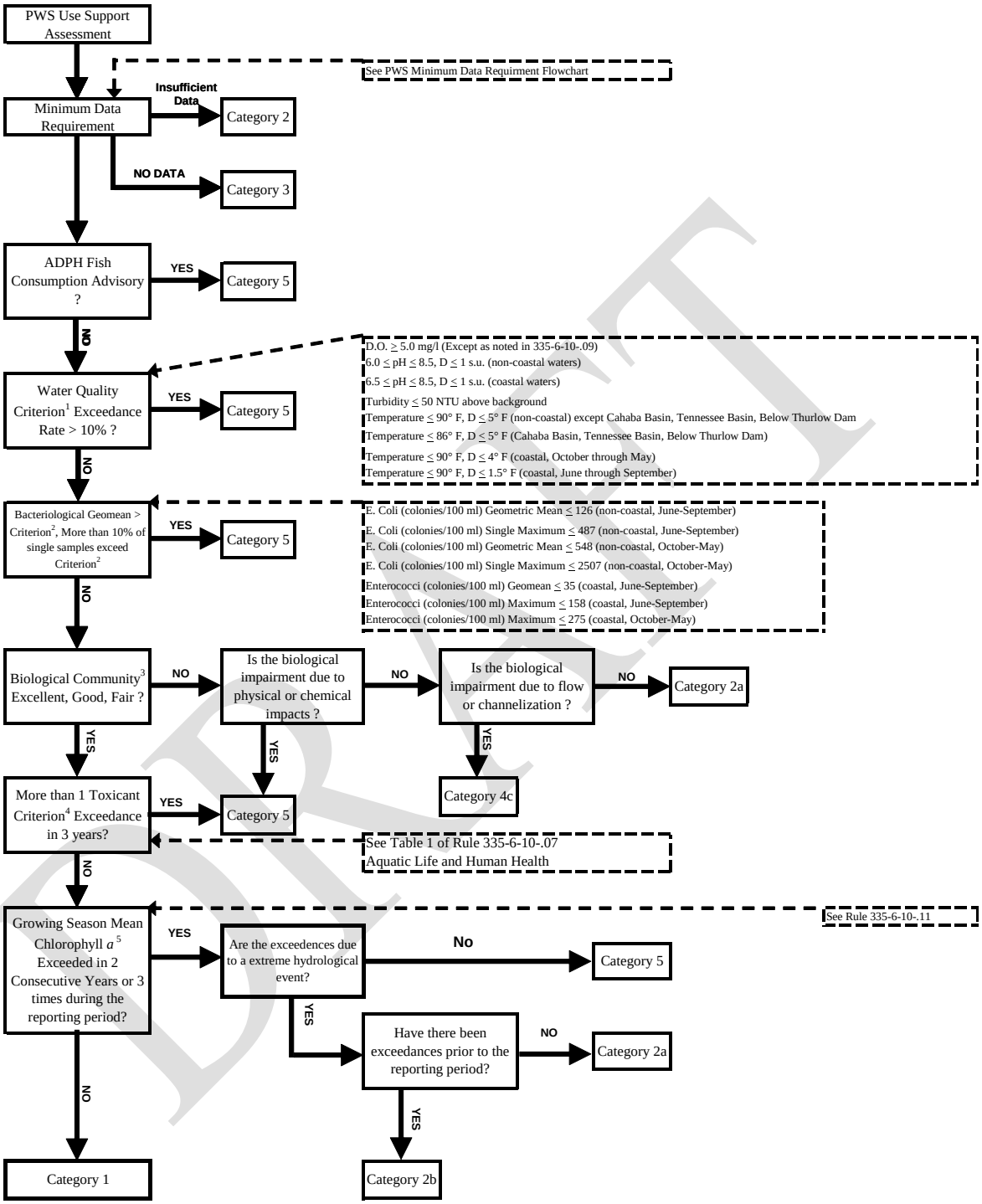
Figure 5
Public Water Supply (PWS) Categorization Methodology



1 Water Quality Criterion refers to pH, Dissolved Oxygen, turbidity, and temperature resulting from heat sources

2 Bacteriological Criterion refers to both the single sample maximum and geometric mean, see discussion in Section 4.2.2

3 Biological community refers to macroinvertebrates and/or fish in wadeable rivers/streams only (See Minimum Data Requirments)

4 Toxicant Criterion refers to toxics listed in 335-6-10-.07

5 Applies only to reservoirs with established Chlorophyll a criteria and not during extreme hydrologic events. Extreme drought conditions are droughts with a drought intensity category of D2 or greater as listed in the U.S. Drought Monitor (http://droughtmonitor.unl.edu/) that persists for 50% or more of the growing season. Extreme flood conditions are streamflows greater than the 75th percentile streamflow based on period of record caused by events such as tropical storms, hurricanes, and unusually intense storm activity.

Special Note - Natural waters may, on occasion, have characteristics outside of the limits established by these criteria. These criteria relate to condition of waters as affected by the discharge of sewage, industrial wastes, or other wastes, not to conditions resulting from natural forces. See 335-6-10-.05(4)

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4.3 *Swimming and Other Whole Body Water-Contact Sports (S)*

The best usage of waters assigned this classification is for swimming and other whole body water-contact sports. Waterbodies assigned the S use, under proper sanitary supervision by the controlling health authorities, will meet accepted standards of water quality for outdoor swimming places and will be considered satisfactory for swimming and other whole body water-contact sports. Beneficial uses encompassed within this classification include: aquatic life support and wildlife propagation, fish and shellfish harvesting and consumption, water contact recreation, agricultural irrigation, livestock watering and industrial cooling and process water supply.

4.3.1 *Minimum Data Requirement for S Waters*

For waters with the S classification, the available data must have been collected consistent with the following standard operating procedures (SOP) manuals:

SOP#	Title
2040	Physical Characterization Stream Flow Abbreviated Measurement Method
63012041(a)	Habitat Assessment Temperature Field Measurements
2044	Turbidity Field Measurements
2046	Field Equipment Cleaning and Storage Procedures Photic Zone Measurements and Visibility Determinations
2047	Station, Sample ID & Chain of Custody Procedures *In-situ* surface water quality Field measurements by Datasonde
2048	Continuous SW Quality Monitoring Using Datasondes
2061	General SW Quality Sample Collection
2062	Dissolved Reactive Phosphorus (DRP) Collection & Field Processing
2063	Water Column Chlorophyll *a* Sample Collection
2064	Surface Water Sample Collection of Bacteria Samples
2065	Sediment Sample Collection
2066	Dissolved Metals Sample Collection and Processing
2067	Organic Sample Collection
5700	Algal Growth Potential Testing (AGPT)
6000	Macroinvertebrate Sample Collection
6001	Macroinvertebrate Sample Processing
6002	Macroinvertebrate Organism Identification
6004	Macroinvertebrate Sample Data Analysis
6100	Fish Index of Biotic Integrity Sample Collection Procedure for Wadeable Streams
6300	Physical Characterization
6301	Habitat Assessment
9021	Field Quality Control Measurements and Samples
9025	Field Equipment Cleaning and Storage
9040	Station, Sample ID & Chain of Custody Procedures

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In addition, the data must have been collected within the last six years. The six-year timeframe would capture all data collected by ADEM during one complete rotation of the five-year monitoring schedule currently used by the Department. Failure to satisfy both of these conditions places the waterbody in Category 2. If these two conditions are met, the determination of the minimum data requirement is dependent upon the waterbody type. Waterbody types include wadeable rivers and streams, non-wadeable rivers and streams, reservoirs and reservoir embayments, and estuary and coastal waters. Failure to meet the minimum data requirement will place the waterbody in Category 2. The following list and **Figure 6** describe the minimum data requirement for assessing waters classified as S.

- Wadeable River or Stream
    - 1 Level IV Intensive Wadeable Multi-habitat Bioassessment (WMB-I) or 2 Level III Wadeable Multi-habitat Bioassessments – EPT Families (WMB-EPT) or 1 Level III WMB-EPT plus 1 fish community assessment (IBI). In addition, a habitat assessment must be completed with each biological assessment. Currently, metrics for the fish IBI have been calibrated only in the Black Warrior and Cahaba River basins.
    - 3 conventional parameter samples (including samples for nutrient analysis)
    - 10 bacteriological samples (2 geometric mean samples)

    OR

    - 8 conventional parameter samples (including samples for nutrient analysis)
    - 10 bacteriological samples (2 geometric mean samples)
    - 3 pesticide / herbicide samples

- Non-wadeable River or Stream
    - 8 conventional parameter samples (including samples for nutrient analysis)
    - 10 bacteriological samples (2 geometric mean samples)
    - 3 pesticide / herbicide samples
    - 3 inorganic samples

- Reservoirs and Embayments
    - 8 conventional parameter samples (including samples for nutrient analysis)
    - 3 bacteriological samples
    - 1 fish tissue analysis from the reservoir mainstem
    - 7 chlorophyll *a* samples collected between April and October (For the Tennessee River Basin: 6 chlorophyll *a* samples collected between April and September). Results from critical period sampling (i.e., August sample only) will be used with other critical period data to evaluate chlorophyll *a* trends at a given sampling location.

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- Estuary or Coastal Waters
    - 8 conventional parameter samples (including samples for nutrient analysis)
    - 10 bacteriological samples (2 geometric mean samples)

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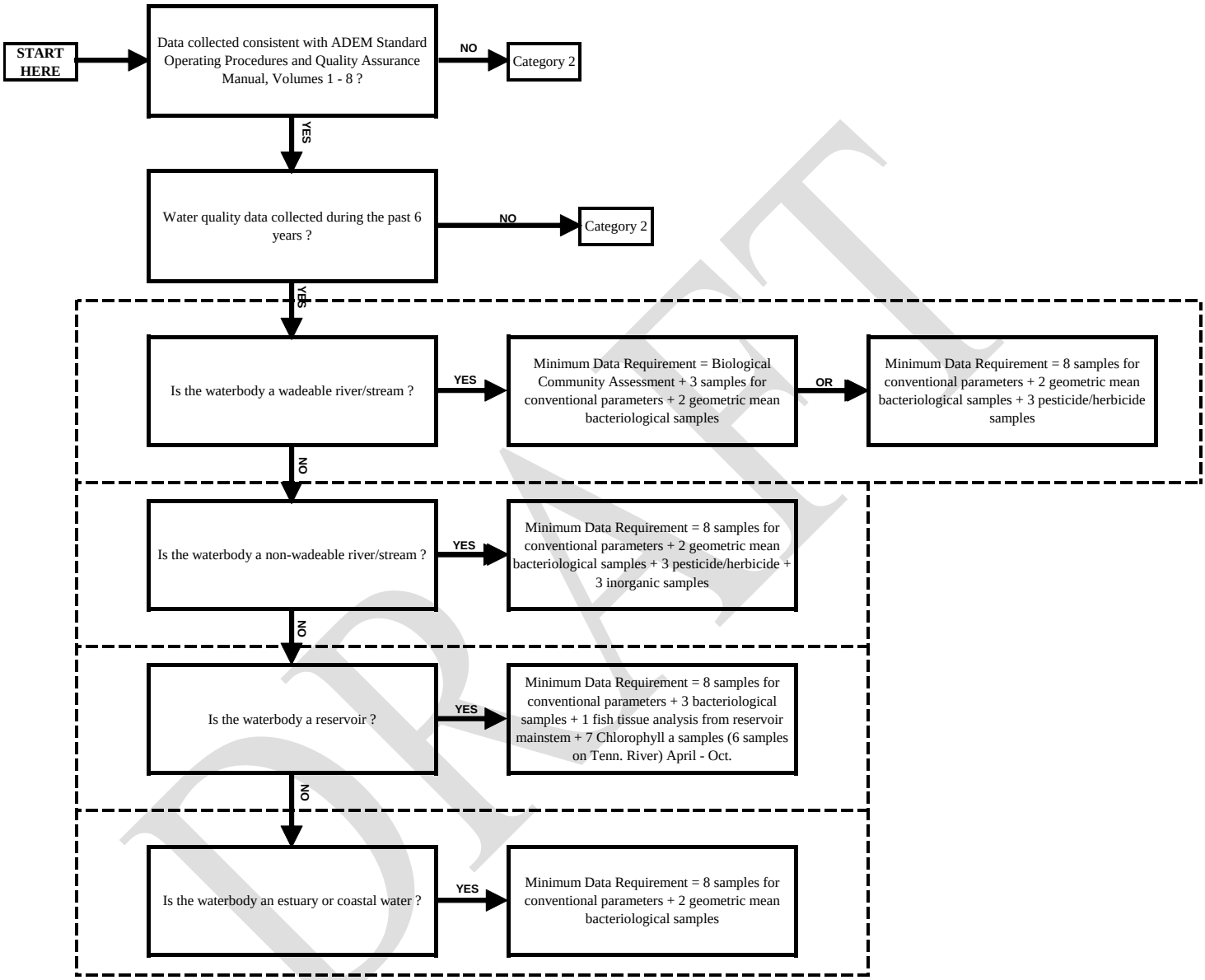
Figure 6
Minimum Data Requirements for the S Designated Use



Biological community assessment means:
1 Level IV Intensive Wadeable Multi-habitat Bioassessment (WMB-I) or
2 Level III Wadeable Multi-habitat Bioassessments – EPT Families (WMB-EPT) or
1 Level III WMB-EPT plus 1 fish community assessment (IBI)

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4.3.2 *Use Support Assessment for S Waters*

Once the minimum data requirement has been met an assessment of the data can be completed resulting in the categorization of the waterbody as either fully supporting the S use (Category 1) or not fully supporting the S use (Category 5). The assessment process considers the available data and may include any fish consumption advisories, shellfish harvesting closure notices, chemical specific data, bacteriological data, biological community assessments, habitat assessments, periphyton assessments, beach closure notices and toxicity evaluations. **Figure 7** illustrates the assessment process for S waters.

The S waterbody can be placed in Category 1 if all the following are true:	
Issue	**Condition**
Consumption Advisories	No fish/shellfish consumption advisory issued by the Alabama Department of Public Health (ADPH).
Macroinvertebrate and Fish Assessments	Level IV WMB-I assessment "fair", "good" or "excellent", or;[17] At least one of Level III WMB-EPT assessments "fair", "good", or "excellent", or;[17] Level III WMB-EPT assessment and fish IBI "fair", "good" or "excellent".[17]
Chlorophyll *a* Data	Growing season mean chlorophyll *a* criterion has not been exceeded in two consecutive years where such a criterion has been established.[18]
Toxic Pollutants	No more than one exceedance of a particular toxic pollutant criterion in previous six years.
Conventional Parameters[19]	No more than a 10% exceedance rate for any given parameter.[20]
Bacteriological Data	**Non-Coastal Waters:** **A.** A single sample result in excess of 235 colonies/100 ml E. coli will require a follow-up geometric mean sampling event. The geometric mean E. coli density must be less than or equal to 126 colonies/100 ml, or; **B.** 10% or less of single samples must be less than or equal to 235 colonies/100 ml.[20]
	Coastal Waters: **A.** A single sample result in excess of 104 colonies/100 ml enterococci will require a follow-up geometric mean sampling event. The geometric mean enterococci density must be less than 35 colonies/100 ml, or; **B.** 10% or less of single samples must be less than or equal to 104 colonies/100 ml.[20]

[17] Applicable to wadeable streams only.

[18] Chlorophyll *a* values in excess of the criterion, due to extreme hydrological events (i.e. drought, floods), will not be considered as an exceedance of the criterion. Extreme drought conditions are droughts with a drought intensity category of D2 or greater as listed in the U.S. Drought Monitor (http://droughtmonitor.unl.edu/) that persists for 50% or more of the growing season. Extreme flood conditions are streamflows greater than the 75th percentile streamflow based on period of record caused by events such as tropical storms, hurricanes, and unusually intense storm activity.

[19] Conventional parameters include DO, pH, temperature (where influenced by heated discharge), and turbidity.

[20] As determined by the binomial distribution function and Table 2.

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The S waterbody can be placed in Category 5 if any of the following are true:	
Issue	**Condition**
Consumption Advisories	There is a fish consumption advisory issued by the Alabama Department of Public Health (ADPH).
Macroinvertebrate and Fish Assessments	Level IV WMB-I assessment less than "fair", or;[21] Both Level III WMB-EPT assessments less than "fair", or;[21] Level III WMB-EPT assessment and fish IBI less than "fair".[21]
Chlorophyll *a* Data	Growing season mean chlorophyll *a* criterion has been exceeded in two consecutive years or three times during the previous six years.[22]
Toxic Pollutants	There is more than one exceedance of a particular toxic pollutant criterion in previous six years.
Conventional Parameters[23]	There is more than a 10% exceedance rate for any given parameter.[24]
Bacteriological Data	**Non-Coastal Waters:** ***A.*** A single sample result greater than 235 colonies/100 ml E. coli will require a follow-up geometric mean sampling event. The geometric mean E. coli density is greater than 126 colonies/100 ml, or; ***B.*** More than 10% of single samples are greater than 235 colonies/100 ml.[24]
	Coastal Waters: ***A.*** A single sample result greater than 104 colonies/100 ml enterococci will require a follow-up geometric mean sampling event. The geometric mean enterococci density is greater than 35 colonies/100 ml, or; ***B.*** More than 10% of single samples are greater than 104 colonies/100 ml.[24]

[21] Applicable to wadeable streams only. A potential anthropogenic cause for the degraded condition must be identified using observations made during the sampling events or from information contained in the Department's geographic information system.

[22] Chlorophyll *a* values in excess of the criterion, due to extreme hydrological events (i.e. drought, floods), will not be considered as an exceedance of the criterion. Extreme drought conditions are droughts with a drought intensity category of D2 or greater as listed in the U.S. Drought Monitor (http://droughtmonitor.unl.edu/) that persists for 50% or more of the growing season. Extreme flood conditions are streamflows greater than the 75th percentile streamflow based on period of record caused by events such as tropical storms, hurricanes, and unusually intense storm activity. However, once exceedance of the criterion may be sufficient justification for inclusion of a water in Category 5 when the exceedance is determined to be a result of increasing nutrient loading from anthropogenic sources. These determinations will be made on a case-by-case basis and the decision will be documented in the ADB.ADB In any case, when a growing season mean chlorophyll *a* value exceeds the criterion, the reservoir will be identified for re-sampling the following year and enough samples will be collected to ensure that the minimum data requirements necessary to calculate a growing season mean are met.

[23] Conventional parameters include DO, pH, temperature (where influenced by heated discharge), and turbidity.

[24] As determined by the binomial distribution function and Table 2.

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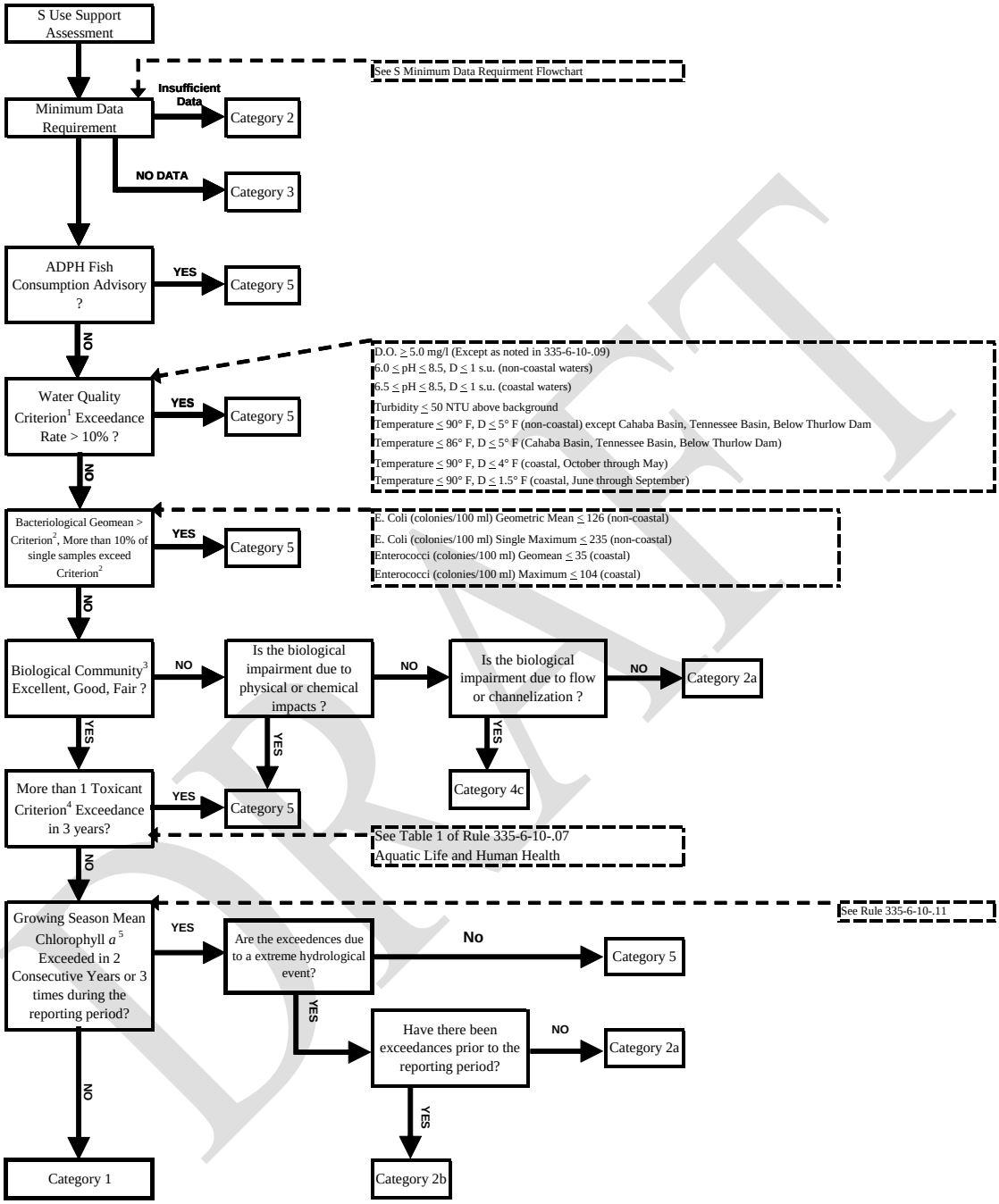
Figure 7

Swimming and Other Whole Body Water-Contact Sports (S) Categorization Methodology



1 Water Quality Criterion refers to pH, Dissolved Oxygen, turbidity, and temperature resulting from heat sources

2 Bacteriological Criterion refers to both the single sample maximum and geometric mean, see discussion in Section 4.3.2

3 Biological community refers to macroinvertebrates and/or fish in wadeable rivers/streams only (See Minimum Data Requirments)

4 Toxicant Criterion refers to toxics listed in 335-6-10-.07

5 Applies only to reservoirs with established Chlorophyll a criteria and not during extreme hydrologic events. Extreme drought conditions are droughts with a drought intensity category of D2 or greater as listed in the U.S. Drought Monitor (http://droughtmonitor.unl.edu/) that persists for 50% or more of the growing season. Extreme flood conditions are streamflows greater than the 75th percentile streamflow based on period of record caused by events such as tropical storms, hurricanes, and unusually intense storm activity.

Special Note - Natural waters may, on occasion, have characteristics outside of the limits established by these criteria. These criteria relate to condition of waters as affected by the discharge of sewage, industrial wastes, or other wastes, not to conditions resulting from natural forces. See 335-6-10-.05(4)

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4.4 *Shellfish Harvesting (SH)*

The best usage of waters assigned this classification is the propagation and harvesting of shellfish (oysters) for sale or for use as a food product. Waterbodies assigned the SH use will meet the sanitary and bacteriological standards included in the *National Shellfish Sanitation Program Model Ordinance, 1999, Chapter IV*, published by the Food and Drug Administration, U.S. Department of Health and Human Services and the requirements of the Alabama Department of Public Health. The waters will also be of a quality suitable for the propagation of fish and other aquatic life, including shrimp and crabs. Beneficial uses encompassed within this classification include: aquatic life support and wildlife propagation, fish and shellfish harvesting and consumption, water contact recreation, agricultural irrigation, livestock watering and industrial cooling and process water supply.

4.4.1 *Minimum Data Requirement for SH Waters*

For waters with the SH classification the available data must have been collected consistent with the following standard operating procedures (SOP) manual:

SOP#	Title
2040	Stream Flow Abbreviated Measurement Method
2041(a)	Temperature Field Measurements
2044	Turbidity Field Measurements
2046	Photic Zone Measurements and Visibility Determinations
2047	*In-situ* surface water quality Field measurements by Datasonde
2048	Continuous SW Quality Monitoring Using Datasondes
2061	General SW Quality Sample Collection
2062	Dissolved Reactive Phosphorus (DRP) Collection & Field Processing
2063	Water Column Chlorophyll *a* Sample Collection
2064	Surface Water Sample Collection of Bacteria Samples
2065	Sediment Sample Collection
2066	Dissolved Metals Sample Collection and Processing
2067	Organic Sample Collection
5700	Algal Growth Potential Testing (AGPT)
6000	Macroinvertebrate Sample Collection
6001	Macroinvertebrate Sample Processing
6002	Macroinvertebrate Organism Identification
6004	Macroinvertebrate Sample Data Analysis
6100	Fish Index of Biotic Integrity Sample Collection Procedure for Wadeable Streams
6300	Physical Characterization
6301	Habitat Assessment
9021	Field Quality Control Measurements and Samples
9025	Field Equipment Cleaning and Storage Procedures
9040	Station, Sample ID & Chain of Custody Procedures

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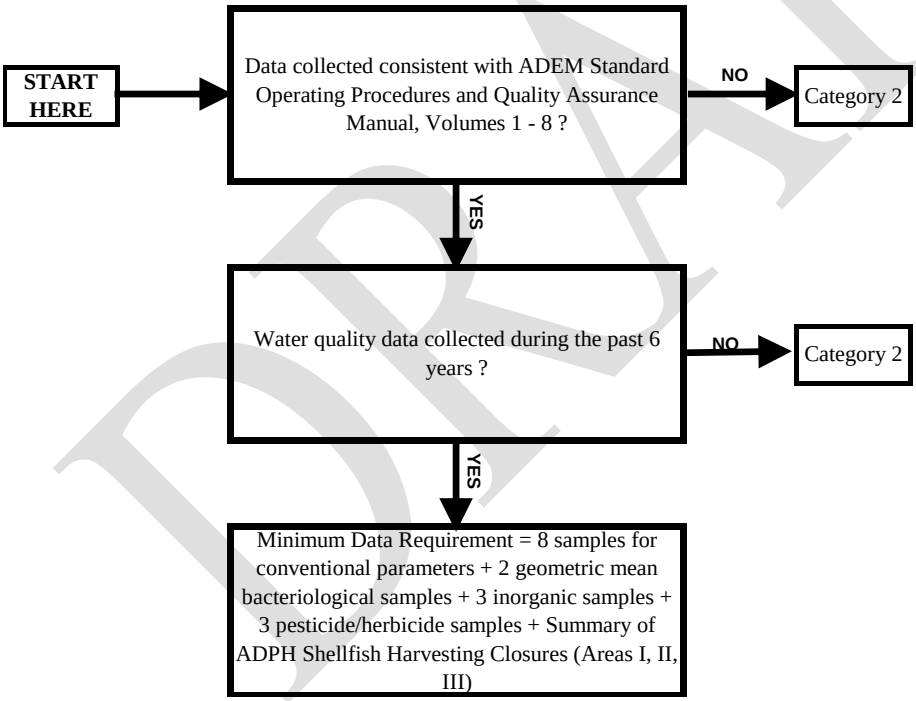
In addition, the data must have been collected within the last six years. The six-year timeframe would capture all data collected by ADEM during one complete rotation of the five-year monitoring schedule currently used by the Department. Failure to satisfy both of these conditions places the waterbody in Category 2. The following list and **Figure 8** describe the minimum data requirement for assessing waters classified as SH.

- 8 conventional parameter samples (including samples for nutrient analysis)
- 10 bacteriological samples (2 geometric mean samples)
- 3 inorganic samples
- 3 pesticide/herbicide samples
- Summary of ADPH shellfish harvesting closure notices for Areas I, II, and III

Figure 8
Minimum Data Requirements for the SH Designated Use



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4.4.2 *Use Support Assessment for SH Waters*

Once the minimum data requirement has been met an assessment of the data can be completed resulting in the categorization of the waterbody as either fully supporting the SH use (Category 1) or not fully supporting the SH use (Category 5). The assessment process considers the available data and may include any fish consumption advisories, shellfish harvesting closure notices, chemical specific data, bacteriological data, and toxicity evaluations. **Figure 9** illustrates the assessment process for SH waters.

The SH waterbody can be placed in Category 1 if all the following are true:	
Issue	**Condition**
Consumption Advisories	No fish/shellfish consumption advisories issued by the Alabama Department of Public Health (ADPH).
Macroinvertebrate and Fish Assessments	NA
Chlorophyll *a* Data	NA
Toxic Pollutants	No more than one exceedance of a particular toxic pollutant criterion in previous six years.
Conventional Parameters[25]	No more than a 10% exceedance rate for any given parameter.[26]
Bacteriological Data	**Non-Coastal Waters:** **A.** A single sample result greater than 235 colonies/100 ml E. coli will require a follow-up geometric mean sampling event. The geometric mean E. coli density must be less than or equal to 126 colonies/100 ml, or; **B.** 10% or less of single samples must be less than or equal to 235 colonies/100 ml.[26]
	Coastal Waters: **A.** A single sample result greater than or equal to 43 colonies /100 ml fecal coliform or a geometric mean greater than or equal to 14 colonies /100 ml fecal coliform. **B.** A single sample result greater than 104 colonies/100 ml enterococci will require a follow-up geometric mean sampling event. The geometric mean enterococci density must be less than 35 colonies/100 ml or; **C.** 10% or less of single samples must be less than or equal to 104 colonies/100 ml.[26]

[25] Conventional parameters include DO, pH, temperature (where influenced by heated discharge), and turbidity.
[26] As determined by the binomial distribution function and Table 2.

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The SH waterbody can be placed in Category 5 if any of the following are true:	
Issue	**Condition**
Consumption Advisories	There is a fish consumption advisory issued by the Alabama Department of Public Health (ADPH) or the shellfish growing areas are "conditionally open" or "conditionally restricted".
Macroinvertebrate and Fish Assessments	NA
Chlorophyll *a* Data	NA
Toxic Pollutants	There is more than one exceedance of a particular toxic pollutant criterion in previous six years.
Conventional Parameters[27]	There is more than a 10% exceedance rate for any given parameter.[28]
Bacteriological Data	**Non-Coastal Waters:** **A.** A single sample result greater than 235 colonies/100 ml E. coli will require a follow-up geometric mean sampling event. The geometric mean E. coli density is greater than 126 colonies/100 ml, or; **B.** More than 10% of single samples exceed 235 colonies/100 ml.[28]
	Coastal Waters: **A.** A single sample result greater than or equal to 43 colonies /100 ml fecal coliform or a geometric mean greater than or equal to 14 colonies /100 ml fecal coliform. **B.** A single sample result greater than 104 colonies/100 ml enterococci will require a follow-up geometric mean sampling event. The geometric mean enterococci density is greater than 35 colonies/100 ml, or; **C.** More than 10% of single samples exceed 104 colonies/100 ml enterococci.[28]

[27] Conventional parameters include DO, pH, temperature (where influenced by heated discharge), and turbidity.
[28] As determined by the binomial distribution function and Table 2.

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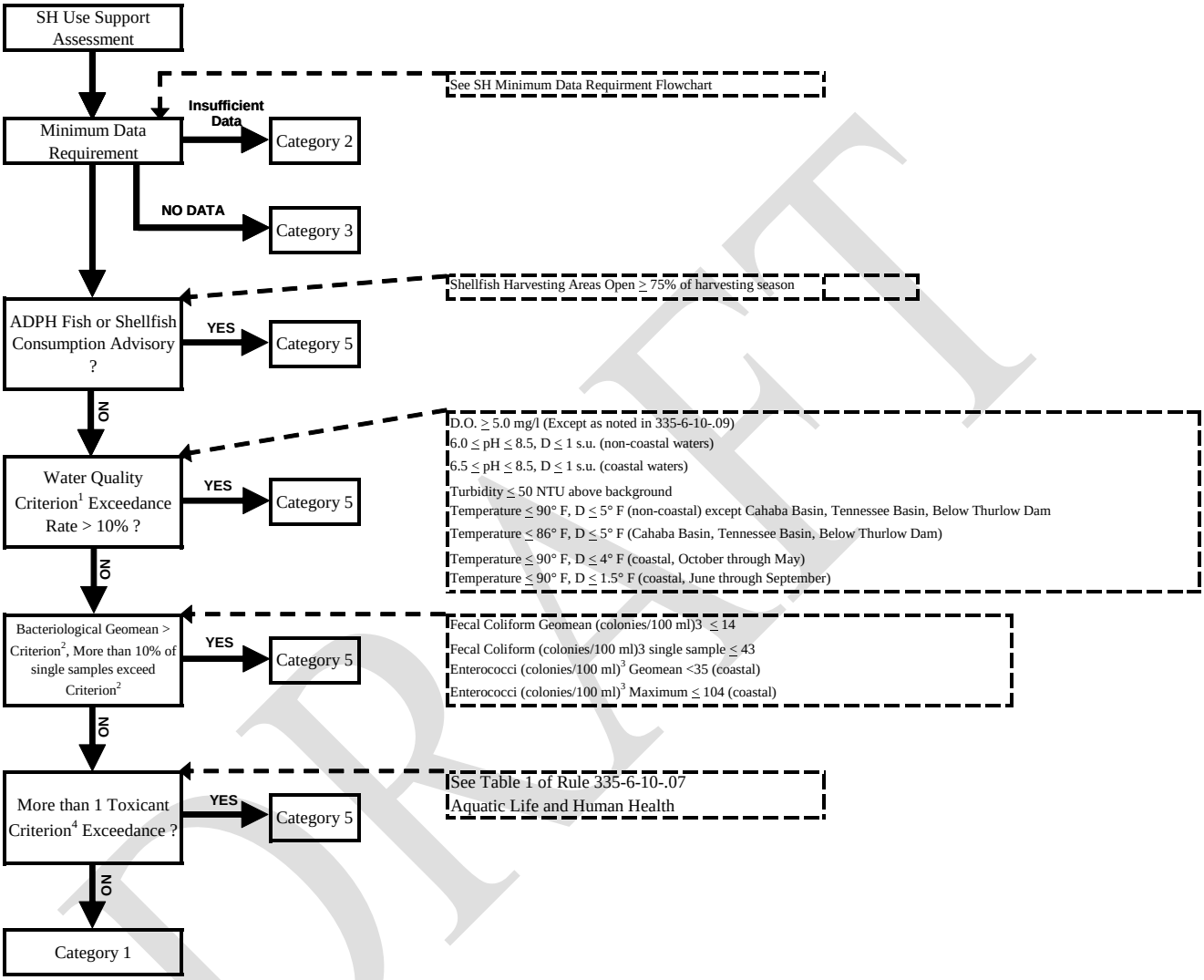
Figure 9
Shellfish Harvesting (SH) Categorization Methodology



1 Water Quality Criterion refers to pH, Dissolved Oxygen, turbidity, and temperature resulting from heat sources

2 Bacteriological Criterion refers to both the single sample maximum and geometric mean

3 Not to exceed the limits specified in the latest edition of the National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish: 2007 Revision, published by the Food and Drug Administration, U.S. Department of Health and Human Services.

4 Toxicant Criterion refers to toxics listed in 335-6-10-.07

Special Note - Natural waters may, on occasion, have characteristics outside of the limits established by these criteria. These criteria relate to condition of waters as affected by the discharge of sewage, industrial wastes, or other wastes, not to conditions resulting from natural forces. See 335-6-10-.05(4)

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4.5 *Fish and Wildlife (F&W)*

The best usage of waters assigned this classification includes fishing, the propagation of fish, aquatic life, and wildlife, and any other usage except swimming and water-contact sports or as a source of water supply for drinking or food-processing purposes. Waterbodies assigned the F&W classification will be suitable for fish, aquatic life and wildlife propagation. The quality of salt and estuarine waters to which this classification is assigned will also be suitable for the propagation of shrimp and crabs. In addition, it is recognized that these waters may be used for incidental water contact and recreation during June through September, except in the vicinity of wastewater discharges or other conditions beyond the control of the ADPH. Under proper sanitary supervision by the controlling health authorities, these waters will meet accepted standards of water quality for outdoor swimming places and will be considered satisfactory for swimming and other whole body water-contact sports during the months of June through September.

4.5.1 *Minimum Data Requirement for F&W Waters*

For waters with the F&W classification the available data must have been collected consistent with the following standard operating procedures (SOP) manuals:

SOP#	Title
2040	Physical Characterization Stream Flow Abbreviated Measurement Method
63012041(a)	Habitat Assessment Temperature Field Measurements
2044	Turbidity Field Measurements
2046	Field Equipment Cleaning and Storage Procedures Photic Zone Measurements and Visibility Determinations
2047	Station, Sample ID & Chain of Custody Procedures *In-situ* surface water quality Field measurements by Datasonde
2048	Continuous SW Quality Monitoring Using Datasondes
2061	General SW Quality Sample Collection
2062	Dissolved Reactive Phosphorus (DRP) Collection & Field Processing
2063	Water Column Chlorophyll *a* Sample Collection
2064	Surface Water Sample Collection of Bacteria Samples
2065	Sediment Sample Collection
2066	Dissolved Metals Sample Collection and Processing
2067	Organic Sample Collection
5700	Algal Growth Potential Testing (AGPT)
6000	Macroinvertebrate Sample Collection
6001	Macroinvertebrate Sample Processing
6002	Macroinvertebrate Organism Identification
6004	Macroinvertebrate Sample Data Analysis
6100	Fish Index of Biotic Integrity Sample Collection Procedure for Wadeable Streams
6300	Physical Characterization
6301	Habitat Assessment
9021	Field Quality Control Measurements and Samples
9025	Field Equipment Cleaning and Storage
9040	Station, Sample ID & Chain of Custody Procedures

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In addition, the data must have been collected within the last six years. The six-year timeframe would capture all data collected by ADEM during one complete rotation of the five-year monitoring schedule currently used by the Department. Failure to satisfy both of these conditions places the waterbody in Category 2. If these two conditions are met, the determination of the minimum data requirement is dependent upon the waterbody type. Waterbody types include wadeable rivers and streams, non-wadeable rivers and streams, reservoirs and reservoir embayments, and estuary and coastal waters. Failure to meet the minimum data requirement will place the waterbody in Category 2. The following list and **Figure 10** describe the minimum data requirement for assessing waters classified as F&W.

- Wadeable River or Stream
    - 1 Level IV Intensive Wadeable Multi-habitat Bioassessment (WMB-I) or 2 Level III Wadeable Multi-habitat Bioassessments – EPT Families (WMB-EPT) or 1 Level III WMB-EPT plus 1 fish community assessment (IBI). In addition, a habitat assessment must be completed with each biological assessment. Currently, metrics for the fish IBI have been calibrated only in the Black Warrior and Cahaba River basins.
    - 3 conventional parameter samples (including samples for nutrient analysis)
    - 3 bacteriological samples

    OR

    - 8 conventional parameter samples (including samples for nutrient analysis)
    - 10 bacteriological samples (2 geometric mean samples)
    - 3 pesticide / herbicide samples
    - 3 inorganic samples

- Non-wadeable River or Stream
    - 8 conventional parameter samples (including samples for nutrient analysis)
    - 10 bacteriological samples (2 geometric mean samples)
    - 3 pesticide / herbicide samples
    - 3inorganic samples

  Reservoirs and Embayments
    - 8 conventional parameter samples (including samples for nutrient analysis)
    - 3 bacteriological samples
    - 1 fish tissue analysis from the reservoir mainstem
    - 7 chlorophyll *a* samples collected between April and October (For the Tennessee River Basin: 6 chlorophyll *a* samples collected between April and September). Results from critical period sampling (i.e., August sample

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only) will be used with other critical period data to evaluate chlorophyll *a* trends at a given sampling location.

- Estuary or Coastal Waters
  - 8 conventional parameter samples (including samples for nutrient analysis)
  - 10 bacteriological samples (2 geometric mean samples)
  - 1 fish tissue analysis

OR

  - 8 conventional parameter samples (including samples for nutrient analysis)
  - 10 bacteriological samples (2 geometric mean samples)
  - 3 pesticide/herbicide samples
  - 3 inorganic samples

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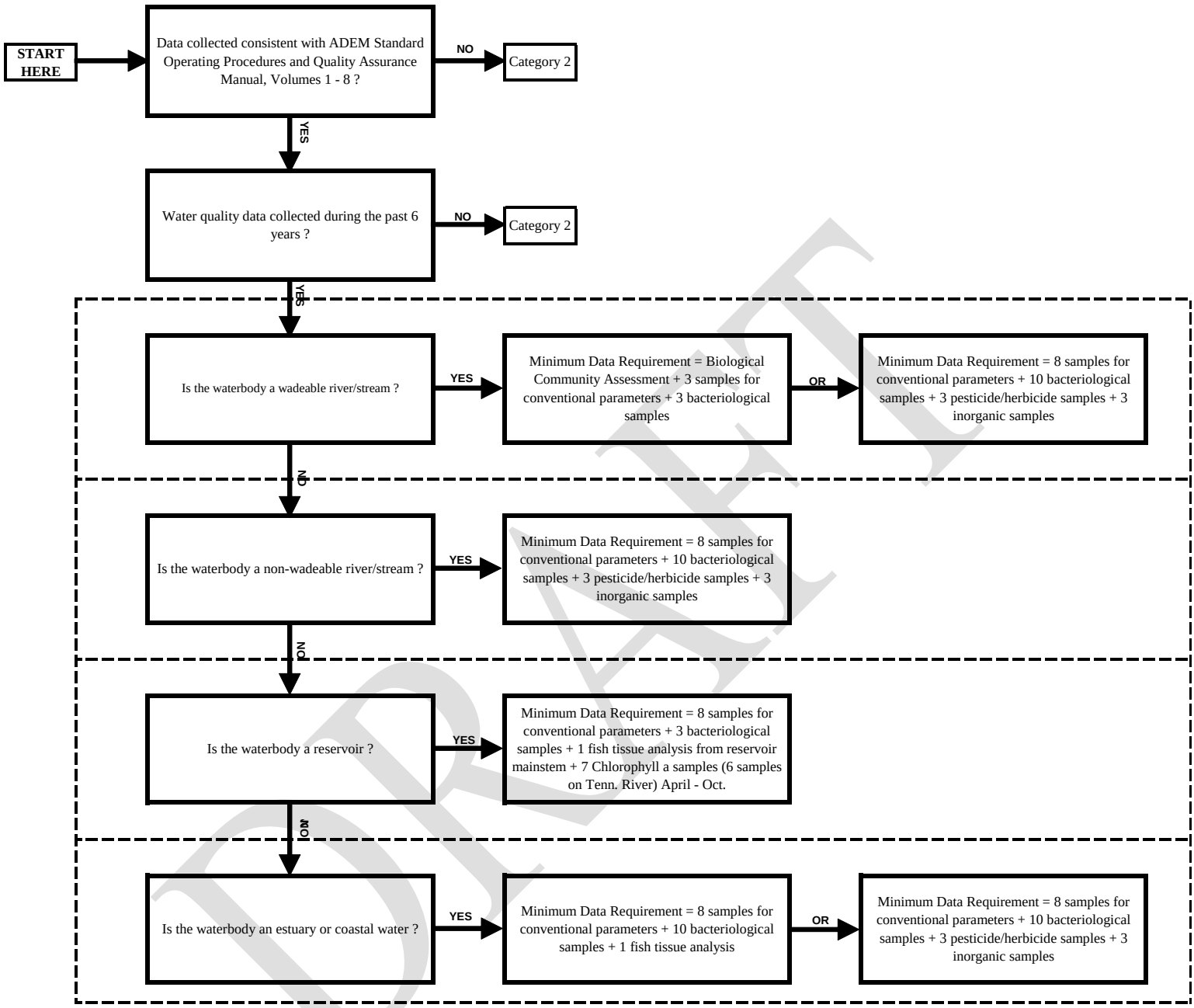
Figure 10
Minimum Data Requirements for the F&W Designated Use



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Biological community assessment means:
1 Level IV Intensive Wadeable Multi-habitat Bioassessment (WMB-I) or
2 Level III Wadeable Multi-habitat Bioassessments – EPT Families (WMB-EPT) or
1 Level III WMB-EPT plus 1 fish community assessment (IBI)

4.5.2 *Use Support Assessment for F&W Waters*

Once the minimum data requirement has been met an assessment of the data can be completed resulting in the categorization of the waterbody as either fully supporting the F&W use (Category 1) or not fully supporting the F&W use (Category 5). The assessment process considers the available data and may include any fish consumption advisories, chemical specific data, biological community assessments, bacteriological data, beach closure notices and toxicity evaluations. **Figure 11** illustrates the assessment process for F&W waters.

The F&W waterbody can be placed in Category 1 if all the following are true:	
Issue	**Condition**
Consumption Advisories	No fish consumption advisory issued by the Alabama Department of Public Health (ADPH).
Macroinvertebrate and Fish Assessments	Level IV WMB-I assessment "fair", "good" or "excellent", or;[29] Either of Level III WMB-EPT assessments "fair", "good", or "excellent", or;[29] Level III WMB-EPT assessment and fish IBI "fair", "good" or "excellent".[29]
Chlorophyll *a* Data	Growing season mean chlorophyll *a* criterion has not been exceeded in two consecutive years where such a criterion has been established.[30]
Toxic Pollutants	No more than two exceedances of a particular toxic pollutant criterion in previous six years or more than one in a 3 year period.
Conventional Parameters[31]	No more than a 10% exceedance rate for any given parameter.[32]
Bacteriological Data	**Non-Coastal Waters:** **A.** A single sample result greater than 487 colonies/100 ml E. coli (June – September) or greater than 2,507 colonies/100 ml E. coli (October – May) will require a follow-up geomean sampling event. The geometric mean E. coli density must be less than or equal to 126 colonies/100 ml (June – September) or less than or equal to 548 colonies/100 ml (October – May), or; **B.** 10% or less of single samples must be less than or equal to 487 colonies/100 ml (June – September) or less than or equal to 2,507 colonies/100 ml (October – May).[32]

[29] Applicable to wadeable streams only.

[30] Chlorophyll *a* values in excess of the criterion, due to extreme hydrological events (i.e. drought, floods), will not be considered as an exceedance of the criterion. Extreme drought conditions are droughts with a drought intensity category of D2 or greater as listed in the U.S. Drought Monitor (http://droughtmonitor.unl.edu/) that persists for 50% or more of the growing season. Extreme flood conditions are streamflows greater than the 75th percentile streamflow based on period of record caused by events such as tropical storms, hurricanes, and unusually intense storm activity.

[31] Conventional parameters include DO, pH, temperature (where influenced by heated discharge), and turbidity.

[32] As determined by the binomial distribution function in Table 2.

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The F&W waterbody can be placed in Category 1 if all the following are true:	
	Coastal Waters: **A.** A single sample result greater than 158 colonies/100 ml E. coli (June – September) or greater than 275 colonies/100 ml E. coli (October – May) will require a follow-up geomean sampling event. The geometric mean enterococci density must be less than or equal to 35 colonies/100 ml (June – September), or; **B.** 10% or less of single samples must be less than or equal to 158 colonies/100 ml (June – September) or less than or equal to 275 colonies/100 ml (October – May).[32]

The F&W waterbody can be placed in Category 5 if any of the following are true:	
Issue	**Condition**
Consumption Advisories	Fish consumption advisory issued by the Alabama Department of Public Health (ADPH).
Macroinvertebrate and Fish Assessments	Level IV assessment less than "fair", or;[33] Both of Level III assessments less than "fair", or;[33] Level III assessment and fish IBI less than "fair".[33]
Chlorophyll *a* Data	Growing season mean chlorophyll *a* criterion has been exceeded in two consecutive years or three times during the previous six years.[34]
Toxic Pollutants	More than two exceedances of a particular toxic pollutant criterion in previous six years or more than one in a 3 year period.
Conventional Parameters[35]	More than a 10% exceedance rate for any given parameter.[36]
Bacteriological Data	**Non-Coastal Waters:** ***A.*** A single sample result greater than 487 colonies/100 ml E. coli (June – September) or greater than 2,507 colonies/100 ml E. coli (October – May) will require a follow-up geometric mean sampling event. The geometric mean E. coli density is greater than 126 colonies/100 ml (June – September) or greater than 548 colonies/100 ml (October – May), or; ***B.*** More than 10% of single samples are greater than 487 colonies/100 ml (June – September) or greater than 2507 colonies/100 ml (October – May).[36]

[33] Applicable to wadeable streams only.
[34] Chlorophyll *a* values in excess of the criterion, due to extreme hydrological events (i.e. drought, floods), will not be considered as an exceedance of the criterion. Extreme drought conditions are droughts with a drought intensity category of D2 or greater as listed in the U.S. Drought Monitor (http://droughtmonitor.unl.edu/) that persists for 50% or more of the growing season. Extreme flood conditions are streamflows greater than the 75th percentile streamflow based on period of record caused by events such as tropical storms, hurricanes, and unusually intense storm activity. One exceedance of the chlorophyll *a* criterion may be sufficient justification for inclusion of a water in Category 5 when the exceedance is determined to be the result of increasing nutrient loading from anthropogenic sources. These determinations will be made on a case-by-case basis and the decision will be documented in the ADB. When a growing season mean chlorophyll *a* value exceeds the criterion, the reservoir will be identified for re-sampling the following year and enough samples will be collected to ensure that the minimum data requirements necessary to calculate a growing season mean are met.
[35] Conventional parameters include DO, pH, temperature (where influenced by heated discharge), and turbidity.
[36] As determined by the binomial distribution function in Table 2.

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The F&W waterbody can be placed in Category 5 if any of the following are true:	
	<u>Coastal Waters:</u> ***A.*** A single sample result greater than 158 colonies/100 ml E. coli (June – September) or greater than 275 colonies/100 ml E. coli (October – May) will require a follow-up geometric mean sampling event. The geometric mean enterococci density is greater than 35 colonies/100 ml, or; ***B.*** More than 10% of single samples are greater than 158 colonies/100 ml (June – September) or greater than 275 colonies/100 ml (October – May).[36]

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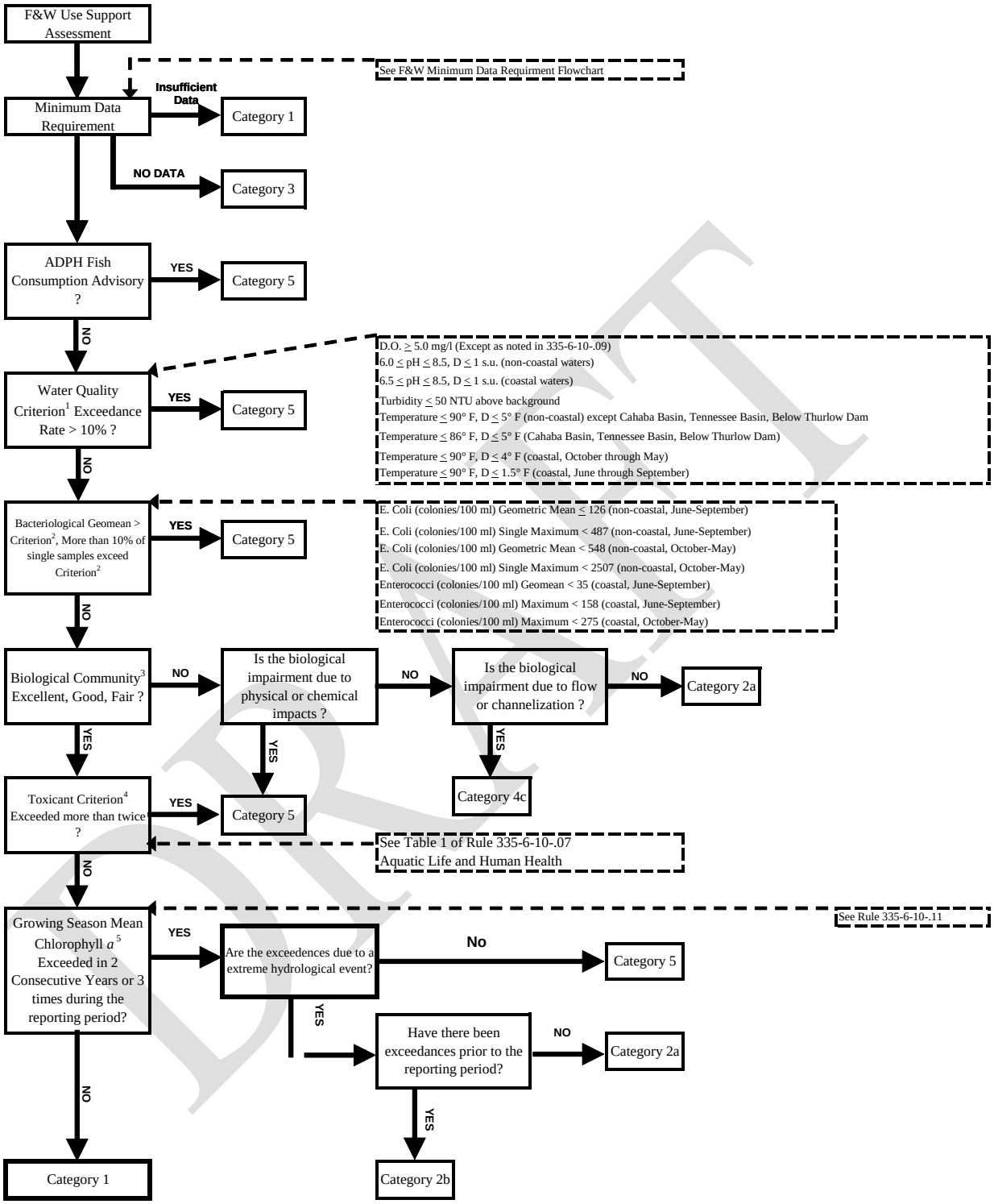
Figure 11
Fish and Wildlife (F&W) Categorization Methodology



1 Water Quality Criterion refers to pH, Dissolved Oxygen, turbidity, and temperature resulting from heat sources

2 Bacteriological Criterion refers to both the single sample maximum and geometric mean, see discussion in Section 4.5.2

3 Biological community refers to macroinvertebrates and/or fish in wadeable rivers/streams only (See Minimum Data Requirments)

4 Toxicant Criterion refers to toxics listed in 335-6-10-.07

5 Applies only to reservoirs with established Chlorophyll a criteria and not during extreme hydrologic events. Extreme drought conditions are droughts with a drought intensity category of D2 or greater as listed in the U.S. Drought Monitor (http://droughtmonitor.unl.edu/) that persists for 50% or more of the growing season. Extreme flood conditions are streamflows greater than the 75th percentile streamflow based on period of record caused by events such as tropical storms, hurricanes, and unusually intense storm activity.

Special Note - Natural waters may, on occasion, have characteristics outside of the limits established by these criteria. These criteria relate to condition of waters as affected by the discharge of sewage, industrial wastes, or other wastes, not to conditions resulting from natural forces. See 335-6-10-.05(4)

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4.6 *Limited Warmwater Fishery (LWF)*

For the months of December through April the best usage of waters assigned this classification includes fishing, the propagation of fish, aquatic life, and wildlife, and any other usage except swimming and water-contact sports or as a source of water supply for drinking or food-processing purposes. Waterbodies assigned the LWF classification will be suitable for fish, aquatic life and wildlife propagation except during the months of May through November. During May through November the quality of waters to which this classification is assigned will be suitable for agricultural irrigation, livestock watering, industrial cooling and process water supplies, and any other usage, except fishing, bathing, recreational activities, including water-contact sports, or as a source of water supply for drinking or food-processing purposes.

4.6.1 *Minimum Data Requirement for LWF Waters*

For waters with the LWF classification the available data must have been collected consistent with the following standard operating procedures (SOP) manuals:

SOP#	Title
2040	Stream Flow Abbreviated Measurement Method
2041(a)	Temperature Field Measurements
2044	Turbidity Field Measurements
2046	Photic Zone Measurements and Visibility Determinations
2047	*In-situ* surface water quality Field measurements by Datasonde
2048	Continuous SW Quality Monitoring Using Datasondes
2061	General SW Quality Sample Collection
2062	Dissolved Reactive Phosphorus (DRP) Collection & Field Processing
2063	Water Column Chlorophyll *a* Sample Collection
2064	Surface Water Sample Collection of Bacteria Samples
2065	Sediment Sample Collection
2066	Dissolved Metals Sample Collection and Processing
2067	Organic Sample Collection
5700	Algal Growth Potential Testing (AGPT)
6000	Macroinvertebrate Sample Collection
6001	Macroinvertebrate Sample Processing
6002	Macroinvertebrate Organism Identification
6004	Macroinvertebrate Sample Data Analysis
6100	Fish Index of Biotic Integrity Sample Collection Procedure for Wadeable Streams
6300	Physical Characterization
6301	Habitat Assessment
9021	Field Quality Control Measurements and Samples
9025	Field Equipment Cleaning and Storage Procedures
9040	Station, Sample ID & Chain of Custody Procedures

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In addition, the data must have been collected within the last six years. The six-year timeframe would capture all data collected by ADEM during one complete rotation of the five-year monitoring schedule currently used by the Department. Failure to satisfy both of these conditions places the waterbody in Category 2. If these two conditions are met, the determination of the minimum data requirement is dependent upon the waterbody type. Waterbody types include rivers and streams, reservoirs and reservoir embayments, and estuary and coastal waters. Failure to meet the minimum data requirement will place the waterbody in Category 2. The following list and **Figure 12** describe the minimum data requirements for assessing waters classified as LWF.

- River or Stream (Wadeable and Non-wadeable)
    - 8 conventional parameter samples (including samples for nutrient analysis)
    - 5 bacteriological samples (1 geometric mean sample)
    - 3 pesticide / herbicide samples
    - 3 inorganic samples

- Reservoirs and Embayments
    - 8 conventional parameter samples (including samples for nutrient analysis)
    - 3 bacteriological samples
    - 1 fish tissue analysis from the reservoir mainstem

- Estuary or Coastal Waters
    - 8 conventional parameter samples (including samples for nutrient analysis)
    - 5 bacteriological samples (1 geometric mean sample)

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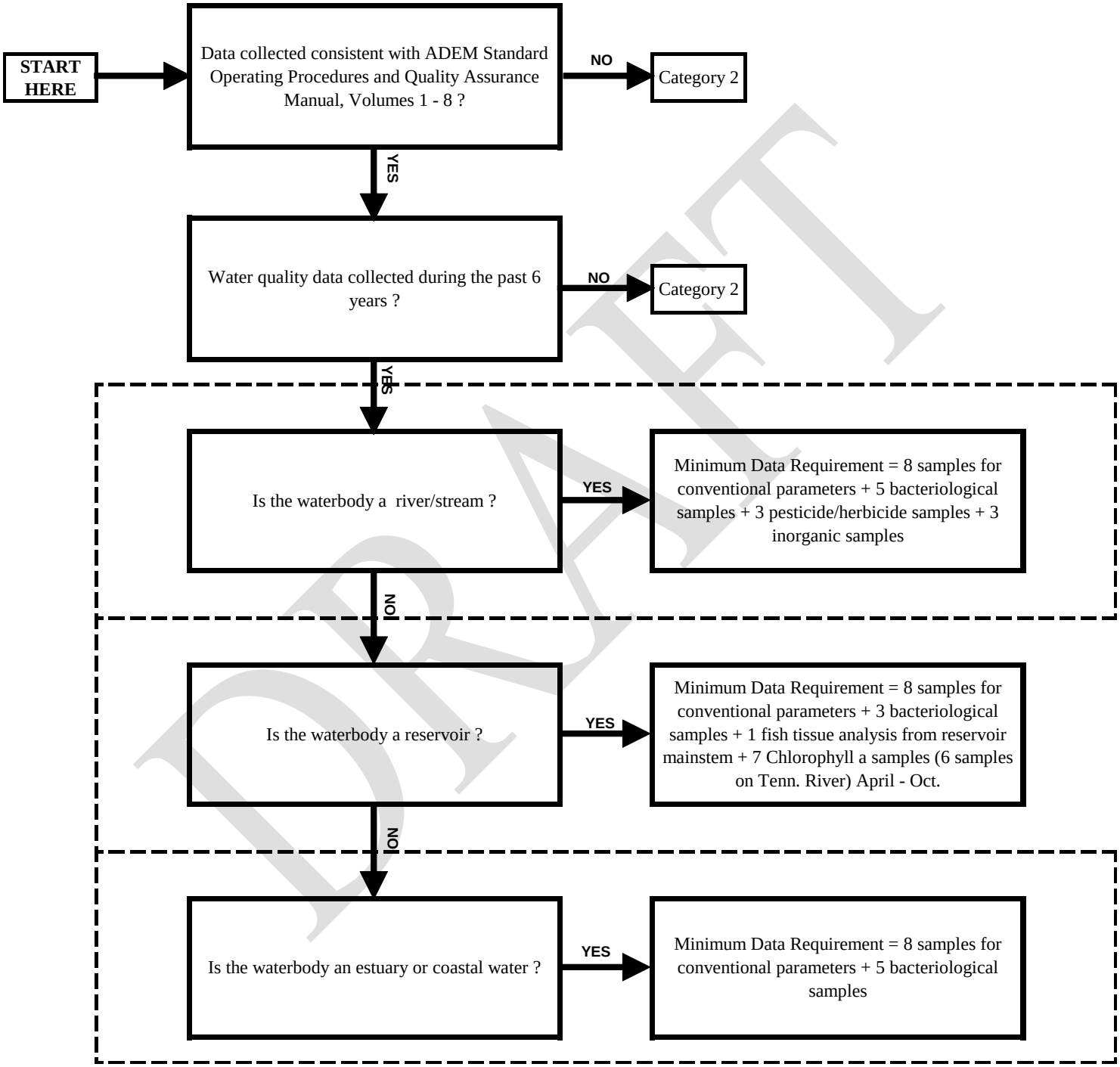
Figure 12
Minimum Data Requirements for the LWF Designated Use



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4.6.2 *Use Support Assessment for LWF Waters*

Once the minimum data requirement has been met an assessment of the data can be completed resulting in the categorization of the waterbody as either fully supporting the LWF use (Category 1) or not fully supporting the LWF use (Category 5). The assessment process considers the available data and may include any fish consumption advisories, chemical specific data, bacteriological data, and toxicity evaluations. However, at the present time there is no available protocol for use of biological assessment results to assess use support in LWF-classified waters. The Department's current SOP for conducting biological assessments employs the use of reference sites located in least impacted watersheds and is intended to assess the "fishable" use. **Figure 13** illustrates the assessment process for LWF waters.

The LWF waterbody can be placed in Category 1 if all the following are true:	
Issue	**Condition**
Consumption Advisories	No fish consumption advisory issued by the Alabama Department of Public Health (ADPH).
Macroinvertebrate and Fish Assessments	NA
Chlorophyll *a* Data	NA
Toxic Pollutants	No more than one exceedance of a particular toxic pollutant acute criterion (May – November) in previous six years. No more than one exceedance of a particular toxic pollutant chronic criterion (December – April).
Conventional Parameters[37]	No more than a 10% exceedance rate for any given parameter.[38]
Bacteriological Data	**Non-Coastal Waters:** **A.** A single sample result greater than 2,507 colonies/100 ml E. coli will require a follow-up geometric mean sampling event. The geometric mean E. coli density must be less than or equal to 548 colonies/100 ml, or; **B.** 10% or less of single samples must be less than or equal to 2,507 colonies/100 ml.[38]
	Coastal Waters: **A.** 10% or less of single samples must be less than 275 colonies/100 ml Enterococci.[38]

[37] Conventional parameters include DO, pH, temperature (where influenced by heated discharge), and turbidity.
[38] As determined by the binomial distribution function in Table 2.

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The LWF waterbody can be placed in Category 5 if any of the following are true:	
Issue	**Condition**
Consumption Advisories	Fish consumption advisory issued by the Alabama Department of Public Health (ADPH).
Macroinvertebrate and Fish Assessments	NA
Chlorophyll *a* Data	NA
Toxic Pollutants	Two or more exceedances of a particular toxic pollutant acute criterion (May – November) during the previous six years or more than one in a 3 year period. Two or more exceedances of a particular toxic pollutant chronic criterion (December – April) during previous six years or more than one in a 3 year period.
Conventional Parameters[39]	More than a 10% exceedance rate for any given parameter.[40]
Bacteriological Data	**Non-Coastal Waters:** ***A.*** A single sample result greater than 2,507 colonies/100 ml E. coli will require a follow-up geometric mean sampling event. The geometric mean E. coli density is greater than 548 colonies/100 ml, or; ***B.*** More than 10% of single samples are greater than 2,507 colonies/100 ml.[40]
	Coastal Waters: ***A.*** More than 10% of single samples are greater than 275 colonies/100 ml Enterococci.[40]

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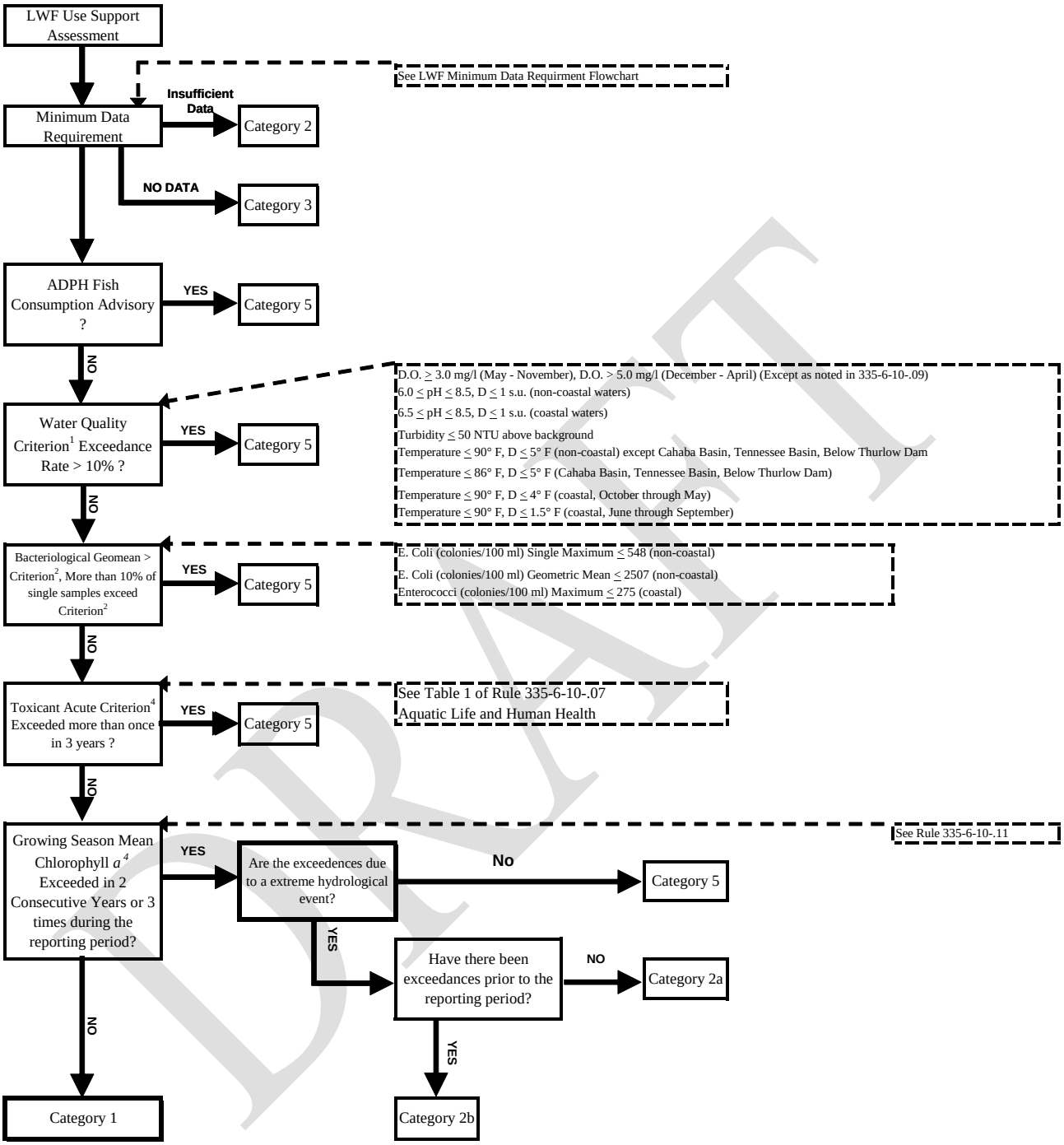
[39] Conventional parameters include DO, pH, temperature (where influenced by heated discharge), and turbidity.
[40] As determined by the binomial distribution function in Table 2.

Figure 13
Limited Warmwater Fishery (LWF) Categorization Methodology



1 Water Quality Criterion refers to pH, Dissolved Oxygen, turbidity, and temperature resulting from heat sources

2 Bacteriological Criterion refers to both the single sample maximum and geometric mean, see discussion in Section 4.6.2

3 Toxicant Criterion refers to toxics listed in 335-6-10-.07

4 Applies only to reservoirs with established Chlorophyll a criteria and not during extreme hydrologic events. Extreme drought conditions are droughts with a drought intensity category of D2 or greater as listed in the U.S. Drought Monitor (http://droughtmonitor.unl.edu/) that persists for 50% or more of the growing season. Extreme flood conditions are streamflows greater than the 75th percentile streamflow based on period of record caused by events such as tropical storms, hurricanes, and unusually intense storm activity.

Special Note - Natural waters may, on occasion, have characteristics outside of the limits established by these criteria. These criteria relate to condition of waters as affected by the discharge of sewage, industrial wastes, or other wastes, not to conditions resulting from natural forces. See 335-6-10-.05(4)

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4.7 *Agricultural and Industrial Water Supply (A&I)*

Best usage of waters assigned this classification include agricultural irrigation, livestock watering, industrial cooling and process water supplies, and any other usage, except fishing, bathing, recreational activities, including water-contact sports, or as a source of water supply for drinking or food-processing purposes. The waters, except for the natural impurities that may be present, will be suitable for agricultural irrigation, livestock watering, industrial cooling waters, and fish survival. The waters will be usable after special treatment, as may be needed under each particular circumstance, for industrial process water supplies. This classification includes watercourses in which natural flow is intermittent and non-existent during droughts and which may, of necessity, receive treated waste from existing municipalities and industries, both now and in the future.

4.7.1 *Minimum Data Requirement for A&I Waters*

For waters with the A&I classification the available data must have been collected consistent with the following standard operating procedures (SOP) manuals:

SOP#	Title
2040	Stream Flow Abbreviated Measurement Method
2041(a)	Temperature Field Measurements
2044	Turbidity Field Measurements
2046	Photic Zone Measurements and Visibility Determinations
2047	*In-situ* surface water quality Field measurements by Datasonde
2048	Continuous SW Quality Monitoring Using Datasondes
2061	General SW Quality Sample Collection
2062	Dissolved Reactive Phosphorus (DRP) Collection & Field Processing
2063	Water Column Chlorophyll *a* Sample Collection
2064	Surface Water Sample Collection of Bacteria Samples
2065	Sediment Sample Collection
2066	Dissolved Metals Sample Collection and Processing
2067	Organic Sample Collection
5700	Algal Growth Potential Testing (AGPT)
6000	Macroinvertebrate Sample Collection
6001	Macroinvertebrate Sample Processing
6002	Macroinvertebrate Organism Identification
6004	Macroinvertebrate Sample Data Analysis
6100	Fish Index of Biotic Integrity Sample Collection Procedure for Wadeable Streams
6300	Physical Characterization
6301	Habitat Assessment
9021	Field Quality Control Measurements and Samples
9025	Field Equipment Cleaning and Storage Procedures
9040	Station, Sample ID & Chain of Custody Procedures

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In addition, the data must have been collected within the last six years. The six-year timeframe would capture all data collected by ADEM during one complete rotation of the five-year monitoring schedule currently used by the Department. Failure to satisfy both of these conditions places the waterbody in Category 2. If these two conditions are met, the determination of the minimum data requirement is dependent upon the waterbody type. Waterbody types include wadeable rivers and streams, non-wadeable rivers and streams, reservoirs and reservoir embayments, and estuary and coastal waters. Failure to meet the minimum data requirement will place the waterbody in Category 2. The following list and **Figure 14** describe the minimum data requirement for assessing waters classified as A&I.

- River or Stream
  - 8 conventional parameter samples (including samples for nutrient analysis)
  - 5 bacteriological samples (1 geometric mean sample)
  - 3 inorganic samples
  - 3 pesticide / herbicide samples

- Reservoirs and Embayments
  - 8 conventional parameter samples (including samples for nutrient analysis)
  - 3 bacteriological samples
  - 1 fish tissue analysis from the reservoir mainstem

- Estuary or Coastal Waters
  - 8 conventional parameter samples (including samples for nutrient analysis)
  - 5 bacteriological samples (1 geometric mean sample)

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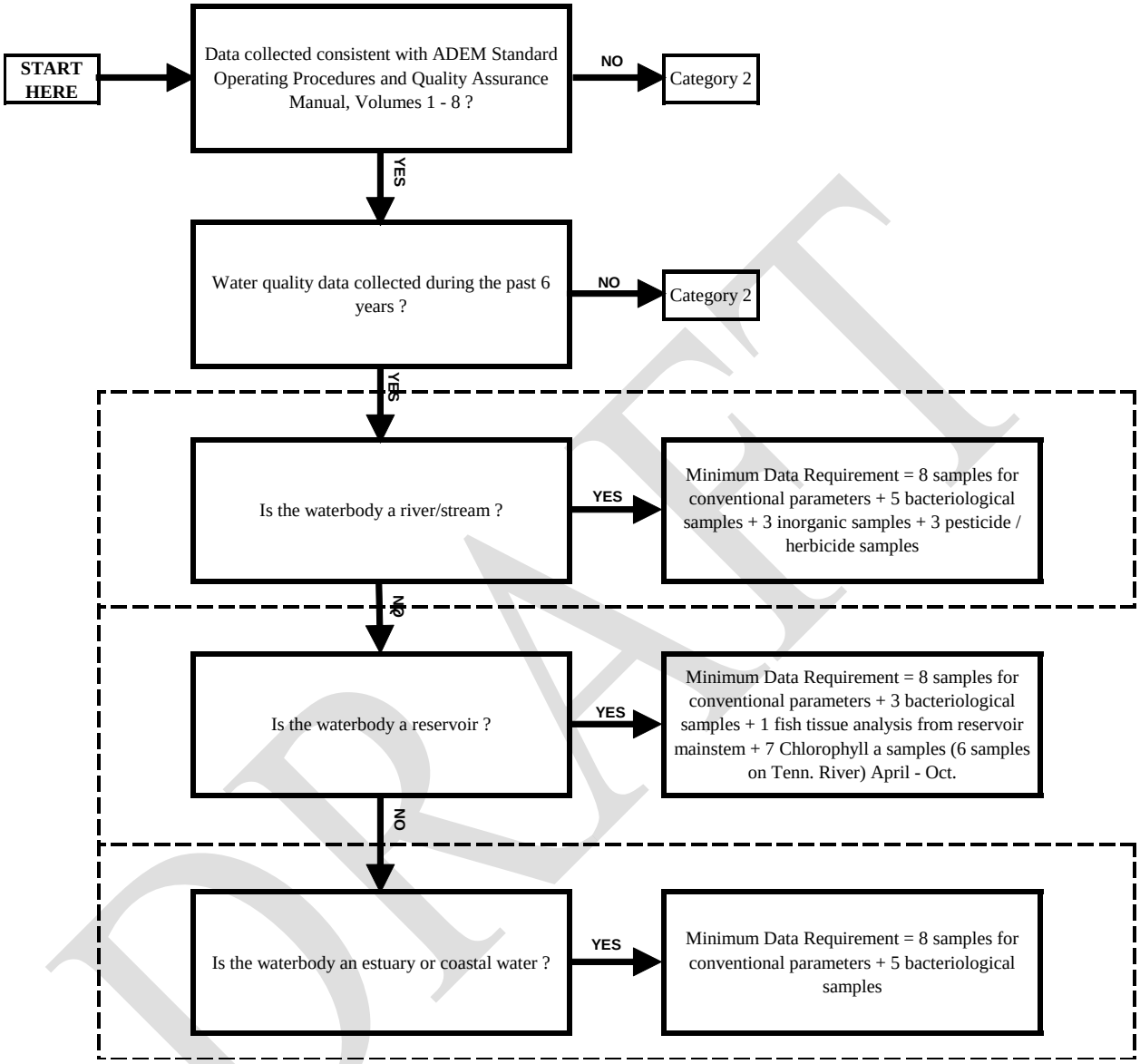
Figure 14
Minimum Data Requirements for the A&I Designated Use



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4.7.2 *Use Support Assessment for A&I Waters*

Once the minimum data requirement has been met an assessment of the data can be completed resulting in the categorization of the waterbody as either fully supporting the A&I use (Category 1) or not fully supporting the A&I use (Category 5). The assessment process considers the available data and may include any fish consumption advisories, chemical specific data, biological community assessments, bacteriological data, beach closure notices and toxicity evaluations. **Figure 15** illustrates the assessment process for A&I waters.

The A&I waterbody can be placed in Category 1 if all the following are true:	
Issue	**Condition**
Consumption Advisories	No fish consumption advisory issued by the Alabama Department of Public Health (ADPH).
Macroinvertebrate and Fish Assessments	NA
Chlorophyll *a* Data	NA
Toxic Pollutants	No more than two exceedances of a particular toxic pollutant acute criterion in previous six years or more than one in a 3 year period.
Conventional Parameters[41]	No more than a 10% exceedance rate for any given parameter.[42]
Bacteriological Data	**Non-Coastal Waters:** **A.** A single sample result greater than 3,200 colonies/100 ml E. coli will require a follow-up geometric mean sampling event. The geometric mean E. coli density must be less than or equal to 700 colonies/100 ml, or; **B.** 10% or less of single samples must be less than or equal to 3,200 colonies/100 ml.[42]
	Coastal Waters: **A.** 10% or less of single samples must be less than or equal to 500 colonies/100 ml.[42]

[41] Conventional parameters include DO, pH, temperature (where influenced by heated discharge), and turbidity.
[42] As determined by the binomial distribution function in Table 2.

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The A&I waterbody can be placed in Category 5 if any of the following are true:	
Issue	**Condition**
Consumption Advisories	Fish consumption advisory issued by the Alabama Department of Public Health (ADPH).
Macroinvertebrate and Fish Assessments	NA
Chlorophyll *a* Data	NA
Toxic Pollutants	More than two exceedances of a particular toxic pollutant acute criterion in previous six years or more than one in a 3 year period.
Conventional Parameters[43]	More than a 10% exceedance rate for any given parameter.[44]
Bacteriological Data	**Non-Coastal Waters:** ***A.*** A single sample result greater than 3,200 colonies/100 ml E. coli will require a follow-up geometric mean sampling event. The geometric mean E. coli density is greater than 700 colonies/100 ml, or; ***B.*** More than 10% of single samples are greater than 3,200 colonies/100 ml.[44]
	Coastal Waters: ***A.*** More than 10% of single samples are greater than 500 colonies/100 ml.[44]

[43] Conventional parameters include DO, pH, temperature (where influenced by heated discharge), and turbidity.
[44] As determined by the binomial distribution function and Table 2.

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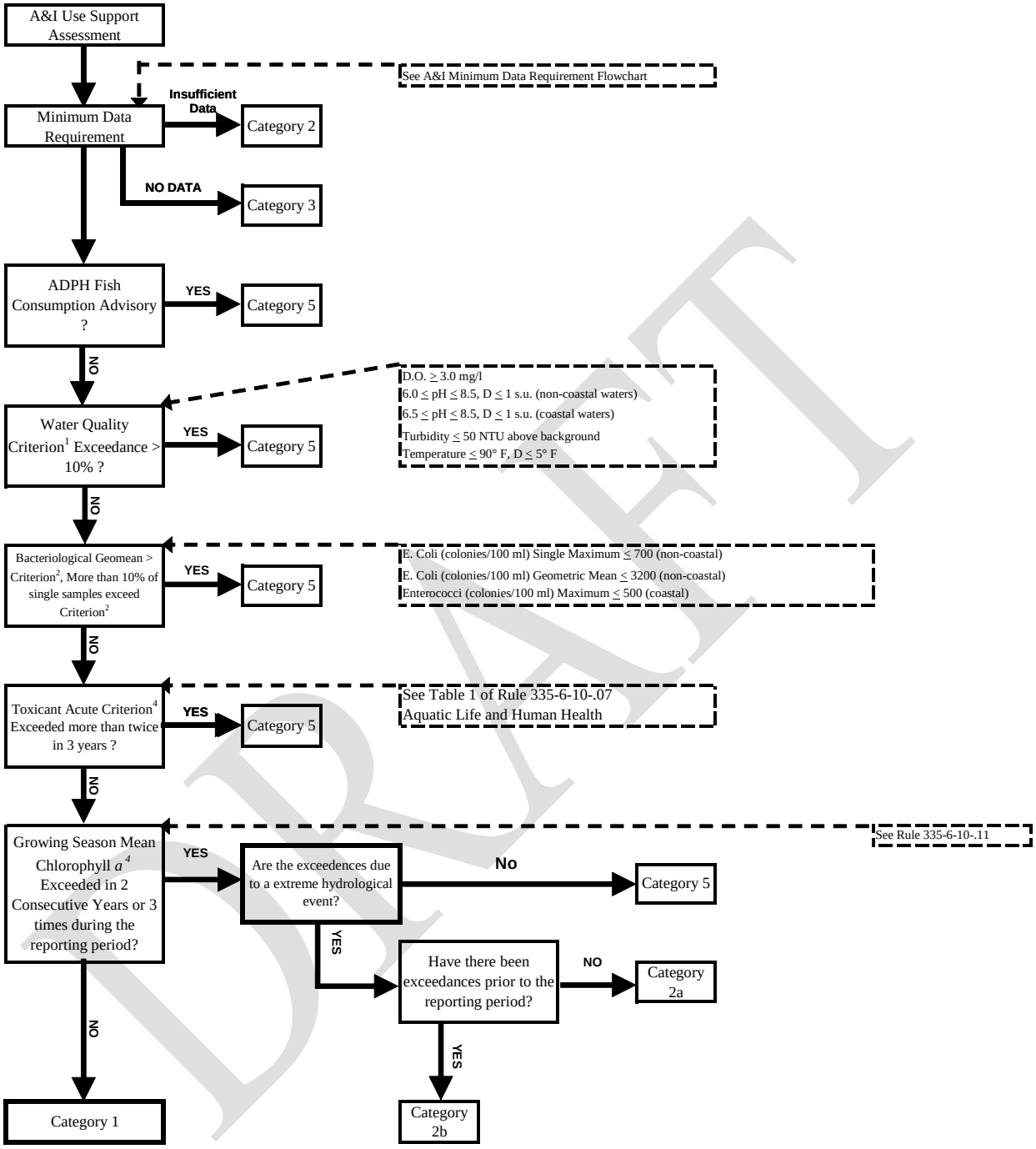
Figure 15

Agricultural and Industrial Water Supply (A&I) Categorization Methodology



1 Water Quality Criterion refers to pH, Dissolved Oxygen, turbidity, and temperature resulting from heat sources

2 Bacteriological Criterion refers to both the single sample maximum and geometric mean, see discussion in Section 4.7.2

3 Toxicant Criterion refers to toxics listed in 335-6-10-.07

4 Applies only to reservoirs with established Chlorophyll a criteria and not during extreme hydrologic events. Extreme drought conditions are droughts with a drought intensity category of D2 or greater as listed in the U.S. Drought Monitor (http://droughtmonitor.unl.edu/) that persists for 50% or more of the growing season. Extreme flood conditions are streamflows greater than the 75th percentile streamflow based on period of record caused by events such as tropical storms, hurricanes, and unusually intense storm activity.

Special Note - Natural waters may, on occasion, have characteristics outside of the limits established by these criteria. These criteria relate to condition of waters as affected by the discharge of sewage, industrial wastes, or other wastes, not to conditions resulting from natural forces. See 335-6-10-.05(4)

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4.8 Other Data considerations and Requirements

4.8.1 *Use of the 10% Rule*

Seasonal variation in water quality conditions, non-anthropogenic impacts (natural conditions), sampling frequency and number of samples collected, and the temporal and spatial sampling coverage of the waterbody must be considered when evaluating water quality data to determine whether a waterbody is fully supporting its designated uses. Most states, including Alabama, determine a waterbody's use support status based on the percent of measured values exceeding a given water quality criterion. Based on USEPA guidance, 10 percent is commonly used as the maximum percent of measurements that may exceed the criterion for waters fully supporting their designated uses. For any given set of samples the percent exceedance indicated by the number of samples which exceed a given criterion is only an estimate of the true percent exceedance for the waterbody segment. As a result, it is important that a level of confidence be assigned to the estimate of percent exceedance for a given set of samples.

Hypothesis testing can be used to make this estimate. When making a decision about whether a water should be included in Category 5 on the basis of data for conventional pollutants, the null hypothesis is that the water is not impaired and sufficient data must be collected to minimize the probability that this assumption is incorrect (Type I error). For the purpose of this methodology, a 90% confidence level will be used so that we can say for a given sample size with a given number of criterion exceedances we are 90% confident that the true exceedance percentage is greater than 0.1 (10%). Using the binomial distribution it is possible to determine the number of exceedances out of a given number of samples that will result in a greater than 10 percent exceedance rate at approximately the 90% confidence level. This is the number of exceedances need to reject the null hypothesis.

When making a decision about whether a water in Category 5 should be removed to Category 1 for a particular conventional pollutant, the null hypothesis is that the water is impaired and sufficient data must be collected to minimize the probability that this assumption is incorrect. Again, a 90% confidence level will be used in the binomial distribution function to estimate the number of samples required to be 90% confident that the water is truly not impaired.

4.8.2 *Use of Data Older than Six Years*

More recent data shall take precedence over older data if:

- The newer data indicate a change in water quality and the change is related to changes in pollutant loading to the watershed or improved pollution control mechanisms in the watershed contributing to the assessed area.

OR

The Department determines that the older data do not meet the data quality requirements of this methodology or are no longer representative of the water quality of the segment.

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Data older than six years will generally not be considered valid, for the purpose of initially placing a water in Category 1 or Category 5, except that data and information older than six years will be considered in the assessment process when such data/information is determined to be reliable. Data older than six years may be used to demonstrate that a waterbody was placed in the wrong category (Category 1 or Category 5) when the original water quality assessment was completed. In addition, data older than six years may be used if the data was not considered during a previous reporting cycle and there is evidence that conditions affecting water quality have not changed since the original data was collected. Waters will not be removed from Category 5 based on the age of data. However, if there is evidence that water quality conditions are likely to have changed since the water was originally placed in Category 1, waterbodies may be removed from Category 1 to Category 2 based on the age of the data

4.8.3 *Use of Accurate Location Data*

Accurate location data is required to ensure the appropriate use classification is applied, as well as confirming that sampling stations are located outside of regulatory mixing zones where water quality criteria do not apply. The monitoring data is acceptable if the locations are correct to within 200 feet. Digital spatial data (GIS or GPS) or latitude/longitude information obtained from USGS 7.5 minute quadrangle maps are acceptable methods of providing location information.

4.8.4 *Use of Temporally Independent Samples and Data from Continuous Monitoring*

When relying solely upon chemical data to determine designated use support, at least ten temporally independent samples of chemical and physical conditions obtained during a time period are needed. That includes conditions considered critical for the particular pollutant of interest. Independent samples, for the purpose of parameters other than bacteria and in-situ water quality measurements, will have been collected at least four days apart. Samples collected at the same location less than four days apart shall be considered as one sample for the purpose of determining compliance with toxic pollutant criteria, with the mean value used to represent the sampling period.

For conventional parameters measured using continuous monitoring instruments such as multi-probe datasondes, compliance with the applicable criteria will be determined at the regulatory depth established for dissolved oxygen measurements. This depth is five feet in water that is ten feet or more in total depth or is at mid-depth in water that is less than ten feet in total depth. Hourly measurements of dissolved oxygen, temperature, and pH data collected using continuous monitoring equipment will be assessed using the same binomial distribution function used for discrete sampling of these parameters. When measurements are made more frequently than hourly, the hourly values will be calculated as the mean of the measured values within each hour.

4.8.5 *Use of Fish / Shellfish Consumption Advisories and Shellfish Growing Area Classifications*

In October 2000 EPA issued guidance to states regarding the use of fish and shellfish consumption advisories (EPA, 2000). The guidance recommended that states consider certain information when determining if designated uses were impaired, including

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consumption advisories for fish and shellfish and certain shellfish growing area classifications. The following is an excerpt from the EPA guidance.

> "*Certain shellfish growing area classifications should be used as part of determinations of attainment of water quality standards and listing of impaired waterbodies. Shellfish growing area classifications are developed by the National Shellfish Sanitation Program (NSSP) using water column and tissue data (where available), and information from sanitary surveys of the contributing watershed, to protect public health. The States review these NSSP classifications every three years. There are certain NSSP classifications that are not appropriate to consider, and certain data and information that should not be considered independently of the classification (unless the data and information were not used in the development or review of the classification). These instances are: "Prohibited" classifications set as a precautionary measure due to the proximity of wastewater treatment discharges, or absence of a required sanitary survey; shellfish tissue pathogen data (which can fluctuate based on short-term conditions not representative of general water quality); or short-term actions to place growing areas in the closed status."*

The ADPH, Seafood Program, regulates shellfish harvesting in coastal waters of Alabama. The ADPH has designated four areas in Mobile Bay and adjacent coastal waters and classifies shellfish harvesting waters within these areas as "conditionally approved", "conditionally restricted", "restricted", "unclassified", and "prohibited". Area I waters comprise most of Mobile Bay south of East Fowl River and west of Bon Secour Bay and including Mississippi Sound. Area II waters include Grand Bay and Portersville Bay with exceptions near wastewater discharges. Area III waters are located in Bon Secour Bay and east of a line drawn from Fort Morgan to Mullet Point. Area IV is located in approximately the northern half of Mobile Bay.

Most of the waters designated as Shellfish Harvesting are classified as "conditionally approved". These harvesting areas are closed when the river stage on the Mobile River at Barry Steam Plant in Bucks, Alabama reaches a river stage of 8.0 feet above mean sea level and a public notice announcing the closure is published. These procedures are described in detail in the Conditional Area Management Plan developed by ADPH (ADPH, 2001). and the 2007 Comprehensive Sanitary Survey of Alabama's Growing Waters in Mobile and Baldwin Counties Area I, Area II and Area III (ADPH, 2008) which can be found at http://adph.org/foodsafety/index.asp?ID=1141

For purposes of making use support decisions relative to the SH designated use, the Department will consider "conditionally approved" and "conditionally restricted" waters as impaired and will include these water in Category 5. In "prohibited" and "unclassified" waters the Department will use water column bacteria sampling results to determine use support. When the applicable bacteria criterion is exceeded in more than 10% of the samples as determined using the binomial distribution function and Table 2, these waters will be included in Category 5.

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The October 2000 EPA guidance concerning the use of fish and shellfish consumption advisories for protection of human health also recommended that state's include waters in Category 5 when there was a consumption advisory which suggested either limited consumption or no consumption of fish due to the presence of toxics in fish tissue. The following is an excerpt from the guidance.

> *"When deciding whether to identify a water as impaired, States, Territories, and authorized Tribes need to determine whether there are impairments of designated uses and narrative criteria, as well as the numeric criteria. Although the CWA does not explicitly direct the use of fish and shellfish consumption advisories or NSSP classifications to determine attainment of water quality standards, States, Territories, and authorized Tribes are required to consider all existing and readily available data and information to identify impaired waterbodies on their section 303(d) lists. For purposes of determining whether a waterbody is impaired and should be included on a section 303(d) list, EPA considers a fish or shellfish consumption advisory, a NSSP classification, and the supporting data, to be existing and readily available data and information that demonstrates non-attainment of a section 101(a) "fishable" use when:*
>
> *1. the advisory is based on fish and shellfish tissue data,*
> *2. a lower than "Approved" NSSP classification is based on water column and shellfish tissue data (and this is not a precautionary "Prohibited" classification or the state water quality standard does not identify lower than "Approved" as attainment of the standard)*
> *3. the data are collected from the specific waterbody in question and*
> *4. the risk assessment parameters (e.g., toxicity, risk level, exposure duration and consumption rate) of the advisory or classification are cumulatively equal to or less protective than those in the State, Territory, or authorized Tribal water quality standards."*

This listing and assessment methodology will consider fish consumption advisories issued by the ADPH as an indication of impaired use in all State waters. However, there may be circumstances under which these waters could be placed in a category other than Category 5. For example, it may be appropriate to place certain waters in Category 4b when activities are ongoing under another restoration program with the goal of restoring the water to fully supporting its uses. These decisions will be made on a case-by-case basis and documented in the ADB.

4.8.6 <u>*Use of Biological Assessments*</u>

Biological assessments compare data from biological surveys and other direct measurements of resident biota in surface waters to established biological criteria and assess the waterbody's degree of use support. Alabama has not established numeric biological criteria (except in the case of chlorophyll <u>*a*</u> in reservoirs) and, as a result, biological data are used as a means of applying narrative criteria contained in Alabama's water quality criteria document (ADEM Administrative Code Chapter 335-6-10). ADEM has been gathering biological assessment data for streams across Alabama since the 1970s. In the early 1990's the Department began assessing the biological health of

wadeable streams using the USEPA Rapid Bioassessment Protocol (Level III Wadeable Multi-habitat Bioassessments – EPT Families (WMB-EPT)) and the Intensive Wadeable Multi-habitat Bioassessment (Level IV Intensive Wadeable Multi-habitat Bioassessment (WMB-I)). USEPA has offered the following technical considerations when using biological data to make use support determinations.

- A waterbody's use support should be based on a comparison of site-specific biological data to a reference condition established for the ecoregion in which the waterbody is located.
- A multimetric approach to bioassessment is recommended.
- The use of a standardized index or sampling period is recommended.
- Standard operation procedures and a quality assurance program should be established.
- A determination of the performance characteristics of the bioassessment methodology is suggested.
- An identification of the appropriate number of sampling sites that are representative of the waterbody is also recommended.

Biological assessment data will be used in combination with other surface water quality data or information to arrive at an overall use support determination. However, EPA recommends that biological data should be weighted more heavily than other types of data when integrating information to make use support determinations since biological data provide a more direct indication of the condition of the aquatic community. Alabama's assessment methodology has weighted biological data more heavily by requiring at least one biological assessment for certain use classifications and stream types and by reducing the number of water quality samples needed when a biological assessment is available. However, the biological assessment must include a habitat assessment conducted at the time of the biological sampling. When available, periphyton assessment data and algal growth potential tests results will be used to refine stressor identification.

In this methodology, several bioassessment methodologies can be used to assess aquatic life use support. Two Level III Wadeable Multi-habitat Bioassessments – EPT Families (WMB-EPT) are required since these assessments are intended for screening purposes only. A combination of one WMB-EPT assessment and one fish IBI assessment is sufficient but only in the Cahaba and Black Warrior River basins since the metric ranges for the fish IBI have been calibrated only to the Cahaba and Black Warrior River basins. Alternatively, one Level IV Intensive Wadeable Multi-habitat Bioassessment (WMB-I) would be sufficient for assessing aquatic life use support. These methodologies are described in detail in the Department's SOPs referenced earlier. Occasionally it may be appropriate to place a water in Category 5 based on a single screening level assessment (WMB-EPT) when there is a clear indication of impairment and the cause is readily apparent. In addition, when assessment results vary significantly between the macroinvertebrate and fish communities, it may be appropriate to place the waterbody in Category 5 when there is an indication of the cause for the discrepancy. These decisions will be made on a case-by-case basis in consultation with the biologist(s) responsible for conducting the assessment and will be documented in the ADB.

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A multi-agency, multi-year effort is currently underway to develop fish IBI metrics for all of Alabama's river basins. As the effort progresses across the state, fish IBI assessments will be incorporated into the use support assessment process. The project is expected be completed by 2011, provided that sufficient funding is available. As other fish IBI metrics are developed, finalized and become available they will be incorporated into the Alabama's Water Quality and Assessment Methodology.

4.8.7 *Use of Data Collected by Others*

Data collected by other agencies, industry or industry groups, neighboring states, and watershed groups will be considered and evaluated provided the data meet the minimum data requirements specified for each designated use and comply with the quality control and quality assurance requirements discussed in Section 4.9. Examples of other agencies and groups collecting water quality data in Alabama include, but are not limited to, the following agencies and groups:

- USGS
- USEPA
- Tennessee Valley Authority
- National Oceanic and Atmospheric Administration
- United States Fish and Wildlife Service
- Mobile Bay National Estuary Program
- Dauphin Island Sea Lab
- Geological Survey of Alabama
- Natural Resources Conservation Service
- Soil and Water Conservation Districts
- Alabama Department of Conservation and Natural Resources
- Alabama Clean Water Partnership
- Alabama Department of Public Health
- Alabama Department of Transportation
- Citizen and Watershed Groups
- Industries and municipalities conducting river monitoring pursuant to NPDES or CWA Section 401 requirements

Data submitted by third parties for consideration should include documentation describing the data, including a study plan or SOP, and certification that the data were (or were not) collected consistent with the requirements presented in this methodology.

4.8.8 *Use of Bacteria Data*

Waterbody segments are sampled for bacteria either as part of a special study, routine ambient monitoring, or as part of the Department's Beach Monitoring Program. Bacteria of the E. coli group are currently used as indicators of the possible presence of pathogens in non-coastal waters. In coastal waters, bacteria of the enterococci group are used as indicators of the possible presence of pathogens. Alabama's bacteria criteria are summarized for each designated use in **Table 1**.

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When assessing the geometric means of bacteria samples, one excursion will generally be sufficient to determine impairment as long as the total number of geometric means is less than eight. When eight or more geometric means are available for assessment, impairment will be determined using Table 2. In addition, both the geometric mean and single sample maximum criteria must be met when the number of individual samples is less than eight. For eight or more individual samples, Table 2 will be used to determine impairment based on exceedances of the single sample criterion.

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Table 1
Alabama's Bacteria Criteria

	Non-Coastal Waters	Coastal Water
Outstanding Alabama Water (OAW)	*E. Coli (colonies/100 ml)* • Geometric Mean ≤ 126 • Single Sample Max ≤ 235	*Enterococci (colonies/100 ml)* • Geometric Mean ≤ 35 • Single Sample Max ≤ 104
Public Water Supply (PWS)	*E. Coli (colonies/100 ml)* June through September • Geometric Mean ≤ 126 • Single Sample Max ≤ 487 October through May • Geometric Mean ≤ 548 • Single Sample Max ≤ 2507	*Enterococci (colonies/100 ml)* June through September • Geometric Mean ≤ 35 • Single Sample Max ≤ 158 October through May • Single Sample Max ≤ 275
Swimming and Other Whole Body Water-Contact Sports (S)	*E. Coli (colonies/100 ml)* • Geometric Mean ≤ 126 • Single Sample Max ≤ 235	*Enterococci (colonies/100 ml)* • Geometric Mean ≤ 35 • Single Sample Max ≤ 104
Shellfish Harvesting (SH)	*E. Coli (colonies/100 ml)* • Geometric Mean ≤ 126 • Single Sample Max ≤ 235	*Fecal Coliform (colonies/100 ml)* • Geometric Mean ≤ 14 • Single Sample Max ≤ 43 *Enterococci (colonies/100 ml)*[13] • Geometric Mean ≤ 35 • Single Sample Max ≤ 104
Fish and Wildlife (F&W)	*E. Coli (colonies/100 ml)* June through September • Geometric Mean ≤ 126 • Single Sample Max ≤ 487 October through May • Geometric Mean ≤ 548 • Single Sample Max ≤ 2507	*Enterococci (colonies/100 ml)* June through September • Geometric Mean ≤ 35 • Single Sample Max ≤ 158 October through May • Single Sample Max ≤ 275
Limited Warmwater Fishery (LWF)	*E. Coli (colonies/100 ml)* • Geometric Mean ≤ 548 • Single Sample Max ≤ 2507	*Enterococci (colonies/100 ml)* • Single Sample Max ≤ 275
Agricultural and Industrial Water Supply (A&I)	*E. Coli (colonies/100 ml)* • Geometric Mean ≤ 700 • Single Sample Max ≤ 3200	*Enterococci (colonies/100 ml)* • Single Sample Max ≤ 500

[13] Not to exceed the limits specified in the latest edition of the *National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish: 2007 Revision*, published by the Food and Drug Administration, U.S. Department of Health and Human Services.

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4.8.9 *Consideration of Stream Flow and Method Detection Limits*

During toxicant sampling in rivers or streams the measured flow must be at or above the 7Q10 value for that location. In cases where the applicable water quality criterion is less than the method detection limit (MDL) for a particular pollutant and the concentration for the pollutant is reported as less than detection (<MDL), the Department will evaluate the data consistent with EPA guidance provided in "*Guidance for Data Quality Assessment*", EPA QA/G-9, QA00 UPDATE, EPA, July 2000 and will use the approach that is appropriate for the data set.

These requirements are intended to ensure that existing water quality conditions are accurately portrayed, do not characterize transitional conditions, and that obsolete or inaccurate data are not used. In addition, the minimum data requirements may change on a case-by-case basis if pollutant sources upstream of the monitoring locations are likely. This determination will be made using information obtained from the Department's geographic information system or other databases. Failure to meet the minimum data requirements for any waterbody type will place the waterbody in Category 2.

4.9 *Quality Control / Quality Assurance Requirements*

Collection and analyses of all data (including chemical, physical, and biological) should be collected and analyzed consistent with the SOPs presented earlier. Study plans should reference the SOP appropriate for the type of data being collected and should discuss how data quality will be documented. This should include a discussion of the quality control procedures followed during sample collection and analysis. These procedures should describe the number and type of field and laboratory quality control samples for the project, if appropriate for the type of sampling being conducted, field blanks, equipment blanks, split samples, duplicate samples, the name of the laboratory performing the analyses, name of the laboratory contact person, and the number and type of laboratory quality control samples.

While the Department will consider any existing and readily available data and information, the Department reserves the right to reject data or information in making use support decisions that do not comply with the minimum data requirements presented in this document. The decision not to use certain data will be documented in the ADB. The Department applies best professional judgment when considering datasets smaller than the specified minimum data requirements. In such instances, use support decisions are made on a case-by-case basis in consideration of ancillary data and information such as watershed characteristics, known pollutant sources, water quality trends or other environmental indicators.

4.10 *Minimum Sample Size and Allowable Number of Water Quality Criterion Exceedances*

Table 2 shows the allowable number of exceedances for various samples sizes up to 199 samples. The Department's annual sampling plans and available resources generally allow for at least eight samples per sampling location except in reservoirs where fewer samples (i.e. 3 samples) may be collected due to sample holding time and resource constraints. The number of exceedances in each range of sample sizes was calculated using the binomial distribution function. This number is the number of exceedances of a particular water quality criterion needed to say with 90% confidence that the criterion is exceeded in more than 10% of the

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population represented by the available samples. This table will be used to determine the number of exceedances of Alabama numeric water quality criteria listed in ADEM Administrative Code 335-6-10 (for dissolved oxygen, temperature, turbidity, pH, and bacteria), consistent with the assessment methodology for each use discussed earlier, necessary to establish that a waterbody segment is not fully supporting its designated uses. This approach is consistent with ADEM Administrative Code 335-6-10 which recognizes that natural conditions may cause sporadic excursions of numeric water quality criteria and with EPA's 1997 305(b) guidance. For conventional water quality parameters, there must be at least eight temporally independent samples collected during the previous six-year period to be considered adequate for making use support determinations, except where fewer samples are determined to be adequate as discussed earlier. As used in this context, temporally independent means that the samples were collected at an interval appropriate to capture the expected variation in the parameter. For example, dissolved oxygen, temperature and pH measurements should capture the normal diurnal variation that occurs in the parameters and temporal independence may occur in several hours (i.e. morning versus afternoon). Measurements for turbidity and bacteria should typically be at least 24 hours apart.

It is the intent of the methodology to ensure that an adequate number of samples are available for use in the assessment process and for developing future monitoring plans. Smaller sample sizes may be appropriate in certain circumstances where there is a clear indication that exceedances of the criteria are not due to natural conditions. For example, a data set comprised of fewer than the required minimum number of samples collected monthly may be sufficient to determine that a waterbody is not supporting its use when a significant number (more than two) exceed a particular criterion. Conversely, a data set with fewer than the required minimum number of samples collected monthly may be sufficient to determine that a waterbody is fully supporting its use if none of the samples exceed any of the criteria and there is sufficient supporting information to support this conclusion (i.e. biological assessment indicates full use support). The decision to use smaller data sets for making use support decisions will be made on a case-by-case basis using best professional judgment. The basis for these decisions will be documented in the ADB.

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Table 2

Minimum Number of Samples Exceeding the Numeric Criterion Necessary for Listing*

Sample Size	Number of Exceedances	Sample Size	Number of Exceedances
8 thru 11	2	97 thru 104	14
12 thru 18	3	105 thru 113	15
19 thru 25	4	114 thru 121	16
26 thru 32	5	122 thru 130	17
33 thru 40	6	131 thru 138	18
41 thru 47	7	139 thru 147	19
48 thru 55	8	148 thru 156	20
56 thru 63	9	157 thru 164	21
64 thru 71	10	165 thru 173	22
72 thru 79	11	174 thru 182	23
80 thru 88	12	183 thru 191	24
89 thru 96	13	192 thru 199	25

* - For conventional parameters, including bacteria, at the 90 percent confidence level

5.0 ***Removing a Waterbody from Category 5***

Waterbodies may be removed from a 303(d) list (category 5) for various reasons, including:

- Assessment of more recent water quality data demonstrates that the waterbody is meeting all applicable water quality standards. (Move to Category 1)
- A review of the original listing decision demonstrates that the waterbody should not have been included in Category 5. (Move to Category 1 or Category 2)
- TMDL has been completed. (Move to Category 4a)
- Other pollution control requirements are reasonably expected to result in the attainment of the water quality standards in the near future. These requirements must be specifically applicable to the particular water quality problem. (Move to Category 4b)
- Impairment is not caused by a pollutant. (Move to Category 4c)
- Natural causes – When it can be demonstrated the exceedance of a numeric water quality criterion is due to natural conditions and not to human disturbance activities.. (Move to Category 1)

Table 3 shows the allowable number of exceedances of criteria for conventional pollutants for various sample sizes and a 90% confidence level. This table will be used to determine the number of allowable exceedances of Alabama numeric water quality criteria for pollutants listed

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in ADEM Administrative Code 335-6-10, with the exception of chlorophyll *a* criteria and the toxics criteria listed in the appendix to ADEM Administrative Code 335-6-10, for the waterbody to be removed from a 303(d) list for a specific pollutant (move to Category 1). In addition, the original basis for listing the waterbody will be considered as a part of the delisting process. Included in this evaluation will be a review of pollutant sources to determine which ones may have been removed or remediated, changes in land practices or uses, installation of new treatment facilities or best management practices, and changes in stream hydrology or morphology.

Table 3

Maximum Number of Samples Exceeding the Numeric Criterion Necessary for Delisting*

Sample Size	Number of Exceedances	Sample Size	Number of Exceedances
8 thru 21	0	104 thru 115	7
22 thru 37	1	116 thru 127	8
38 thru 51	2	128 thru 139	9
52 thru 64	3	140 thru 151	10
65 thru 77	4	152 thru 163	11
78 thru 90	5	164 thru 174	12
91 thru 103	6	175 thru 186	13

* - For conventional parameters, including bacteria, at the 90 percent confidence level

When a waterbody has been included in Category 5 due to a fish consumption advisory, the waterbody will be moved to Category 1 when subsequent fish tissue results indicate that pollutant concentrations have declined and a fish consumption advisory is no longer needed. The determination that a fish consumption advisory is no longer needed is made by the Alabama Department of Public Health.

For waters originally placed in Category 5 due to a specific toxic pollutant or specific toxic pollutants, there should be no violations of the appropriate criteria in a minimum of eight samples collected over a three-year period before the cause of impairment is removed or the water is placed in Category 1.

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6.0 ***Estimating the Size of the Assessed Waterbody***

Waterbodies are assessed based on assessment units. Assessment units vary in size depending on the waterbody type, watershed characteristics, designated use, and the location of monitoring stations. Individual assessments will lie completely within a designated use or a segment with multiple designated uses. For example, an assessment unit will not be partially within one designated use and partially within a different designated use. However, assessment units may be assigned more than one designated use as listed in ADEM Administrative Code R. 335-6-11. For example, an assessment unit may have classified uses of both Fish and Wildlife and Public Water Supply provided both uses are assigned to the entire assessment unit. An assessment unit may be defined as a stream, the mainstem of a river, embayment, portion of a lake or reservoir, or a part of an estuary or coastal water.

A monitoring unit is defined as the watershed draining to, or close to, a sampling location and is made up of many assessment units (individual reaches). A monitoring unit will generally have a drainage area of more than 10 square miles and will be characterized by a predominant land use / land cover. When it is necessary to better characterize assessment units within the larger monitoring units, new monitoring units can be delineated based on the location of the additional sampling location or locations. Water quality data and information gathered at a sampling location which defines a monitoring unit will be the primary means for assigning a use support status to assessment units within the monitoring unit.

The spatial extent of each monitoring unit will be determined using information contained in the Department's Geographic Information System (GIS). Specifically, stream coverage contained within the National Hydrography Dataset (NHD) will be the basis for determining the size of assessed waters. This database of natural and constructed surface waters is a comprehensive set of digital spatial data that contains information about surface water features such as lakes, ponds, streams, rivers, springs and wells. Within the NHD, surface water features are combined to form "reaches", which provide the framework for linking water-related data to the NHD surface drainage network. These linkages enable the analysis and display of these water-related data in upstream and downstream order. Characteristics such as stream length or reservoir area can be aggregated within a monitoring unit to estimate the size of assessed waters.

7.0 ***Ranking and Prioritizing Impaired Waters***

Section 303(d)(1) of the Clean Water Act requires each state to establish a priority ranking for waters it identifies on the 303(d) list (i.e. Category 5 waters) taking into account the severity of pollution and the designated uses of such waters.

The State is to establish Total Maximum Daily Loads (TMDLs) in accordance with its priority ranking strategy; however, States are given considerable flexibility in establishing their ranking method based on their particular circumstances and available resources. Alabama has implemented a basin rotation approach when it comes to monitoring waters and establishing TMDLs. In general, the Draft TMDL date follows the basin rotation monitoring schedule

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because water quality data is the primary driver in the TMDL development process. See *8.0 Schedule for Assessing State Waters.*

ADEM's priority ranking strategy involves placing each waterbody/pollutant combination in one of three categories, namely "high", "medium" or "low". Typically, waters are given a "high" priority when resources are available to develop the TMDL within the next two years. For "medium" priority waters, not all resources and/or tools are available but the TMDL is expected to be developed within the next three to seven years. For "low" priority waters, resources are not readily available and the TMDL is scheduled to be developed in the next 8-12 years. **Figure 16** describes the general approach to assigning a ranking to each impaired waterbody included in Category 5. However, the TMDL development schedule may not always consider only the ranking of the impaired waterbody. The following factors may also be used to determine the timing for the development of the TMDL::

- TMDL complexity
- Pollutants of concern
- Need for additional data and information
- Sources of the pollutants
- Severity of the impairment
- Pending rules and regulations
- Spatial extent of impairment
- General watershed management activities (e.g. 319 grant activities and watershed management planning)
- Existence of endangered and sensitive aquatic species
- Degree of public interest and support for particular waterbodies.

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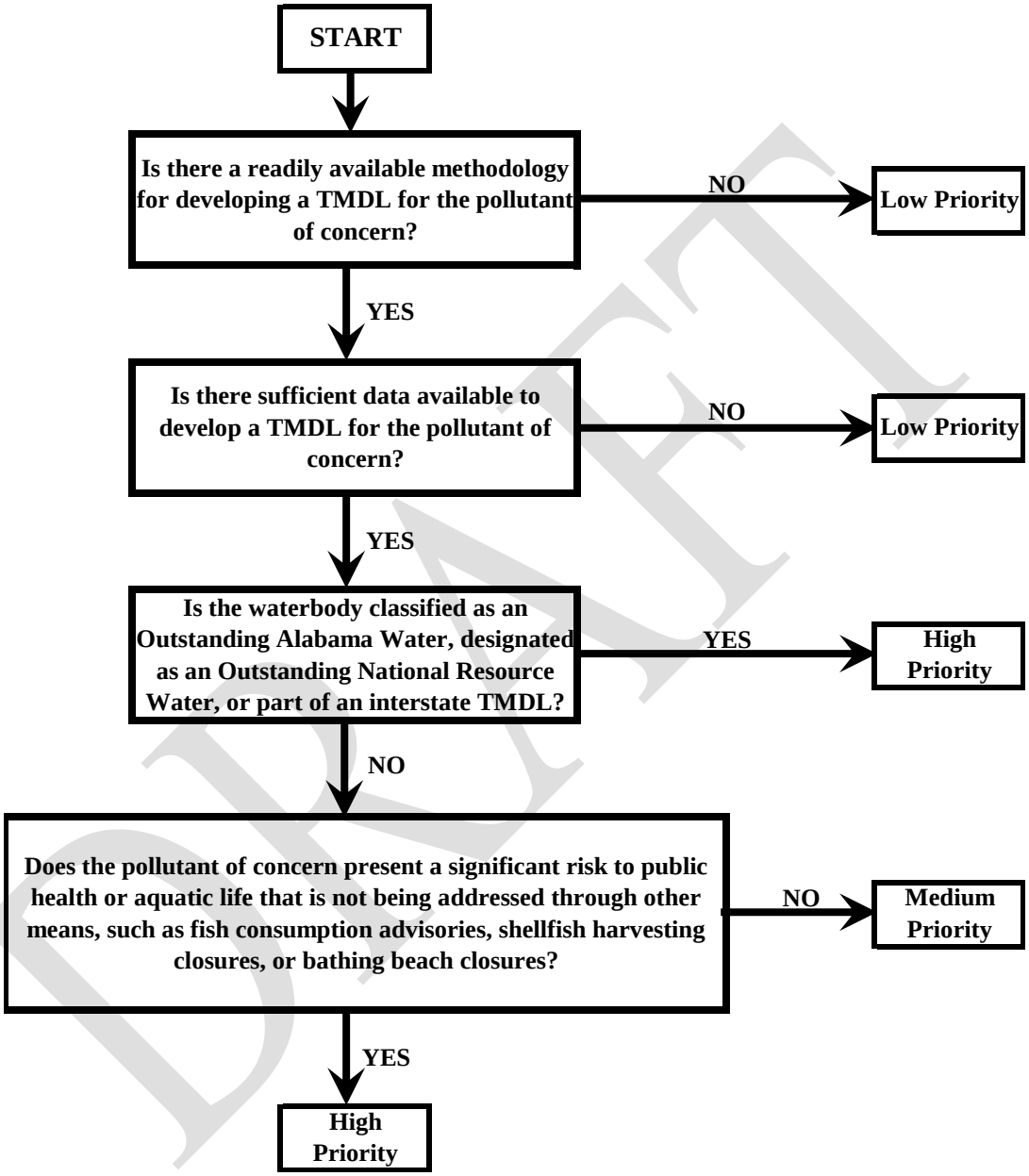
Figure 16

Alabama's TMDL Prioritization Strategy



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Waters which are currently listed on the §303(d) list will have their TMDL developed within 8 to 13 years unless they become eligible for delisting. TMDLs for Category 5 waters will be developed no later than 13 years after the water is first placed in Category 5.

The Integrated Monitoring Report will include proposed schedules (both long term and annually) for the development of TMDLs.

The Department will communicate with bordering states concerning the status of shared waters. When requested, the state will provide data concerning shared waters to the adjacent state.

8.0 ***Schedule for Assessing State Waters***

The State has developed a Watershed Management Schedule and has been operating under the rotating basin plan since 1997. This schedule has the state divided into 5 river basin groups that are sampled on a five-year rotating basis. The rotating basin schedule is as follows:

River Basin Group	Year to be Monitored
Escatawpa / Mobile / Lower Tombigbee / Upper Tombigbee	2011
Black Warrior/Cahaba	2012
Chattahoochee / Chipola / Choctawhatchee / Perdido-Escambia	2013
Tennessee	2014
Alabama / Coosa / Tallapoosa	2015

The Integrated Monitoring and Assessment Report will include a comprehensive monitoring and assessment plan that describes the state's proposed schedule for the following two years. Elements of this plan include a description of the sampling approach (i.e. rotating basin and fixed ambient) and a list of the parameters to be collected (i.e. physical, chemical, and biological). The report will also include a schedule (both long term and annually) for collecting data and information for basic assessments and for TMDLs.

9.0 ***Public Participation***

The Integrated Report will combine the Water Quality Inventory Report (§305(b)) with the Impaired Waterbodies (§303(d)) listing. Category 5 in the Integrated Report is considered the Impaired Waterbodies list. The remaining categories are considered the Water Quality Inventory. This methodology lays out the framework for assessing data and determining which of the five categories the waterbody will be assigned. The entire Integrated List will follow the same public process as the §303(d) listing but Categories 1 through 4 and the monitoring schedule will be provided for informational purposes only since these schedules are subject to change as resources allow.

The Department will solicit the submittal of data and information for use in developing the Integrated Report. The public notice requesting data will be published in four major newspapers in the state and on the Department's Website. The time period for submitting data will be

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specified in the public notice. The data must be received by the Department by October 31 in the year prior to the report being due to EPA. Data submitted after the specified period will be considered in the development of subsequent Integrated Reports. The Department reviews all existing and readily available data and is committed to using only data with acceptable quality assurance to develop the Integrated Report. Only electronic data or data available in published reports are considered "readily available". Typically, the Department uses Microsoft databases (i.e., Excel, Access) or the Water Resources Database (WRDB) for database management and retrieval.

The Department will publish notice of the availability of the Integrated Water Quality Monitoring and Assessment Methodology and Draft Integrated Report in four major newspapers of general circulation throughout the State and on the Department Website. Adjacent states, federal agencies and interstate agencies shall also be noticed as necessary. The Department will coordinate with neighboring states during the development of the Integrated Report, as needed. The comment period on a proposed Category 5 (§303(d)) list will be a minimum of 30 days.

The Integrated Report, which will include the integrated list, expected monitoring schedules, TMDL schedules, as well as any other information usually included in the §305(b) Report, will be submitted to the USEPA as required by §305(b) of the Clean Water Act. The Department will post the availability of the Integrated Report on its web page at that time.

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