Frequently Asked Questions
Contact Recreation
and Bacteria Criteria

Background

Over the years, EPA has required each state to adopt water quality standards that provide a level of protection for water bodies sufficient for full-immersion swimming (Primary Contact Recreation or PCR). The assumption that all water bodies are used for swimming became the default condition, regardless of whether or not swimming occurs, or is even possible, in a given body of water.

Texas has two recreation use categories in the Texas Surface Water Quality Standards (TSWQS): contact and noncontact recreation.

Contact recreation is defined as recreational activities involving a significant risk of ingestion of water, including wading by children, swimming, water skiing, diving, and surfing.

Noncontact recreation is defined as aquatic recreational pursuits not involving a significant risk of water ingestion; including fishing, commercial and recreational boating, and limited body contact incidental to shoreline activity.

Texas Commission on Environmental Quality (TCEQ) has assigned all classified water bodies as supporting either contact or noncontact recreation. Because the default assumption is that a water body supports contact recreation, and because any change to the assigned use designation requires a comprehensive study called a "use attainability analysis" and subsequent endorsement by the EPA, only eight water bodies in the state have received a noncontact designation[1]. Of these, six are coastal waters that experience heavy ship traffic and are therefore unsafe for swimming.

1. What is the Origin of Current Bacteria Criteria?

In 2000 Texas adopted new bacteria criteria in the Surface Water Quality Standards for the water recreation use. These criteria were developed by the US EPA (1986)[2] using epidemiological studies at public swimming beaches in lakes and on the coast. These criteria represented a major technical improvement over the fecal coliform criteria used previously, that had a relatively poor technical basis. The freshwater criterion is a geometric mean of 126 E. coli per 100 mL of water and the saltwater criterion is a geometric mean of 35 Enterococci per 100 mL of water. These criteria were designed to be protective of the swimming use, as part of a national effort to make our waters "fishable and swimmable".

[1] Texas Administrative Code §307.10(1)
[2] US EPA –Ambient Water Quality Criteria for Bacteria-1986.-44015-84-002.

2. **How have the existing criteria worked?**

These criteria have worked well in Texas reservoirs and coastal beaches, where most swimming takes place. However, major problems have been encountered when the freshwater criterion was applied to essentially all waters, including small streams and urban drainage ditches. These waters aren't appropriate to the full body swimming (primary contact recreation) use when the water is only a few inches deep or when it is flowing at a high velocity after a rain when it would be dangerous for swimming. In both of these cases monitoring data have shown high bacteria concentrations. The result has been that hundreds of smaller water bodies having monitoring data that are too high for the freshwater contact recreation criterion and are considered to be "impaired".

Although some streams are used as a "swimming hole" at times, the same stream can go dry in the summer or become dangerously flooded during wet weather. In regards to the latter, research has found that the majority of high bacteria counts (i.e. those exceeding contact recreation standards) occur during periods of high flow when conditions may likely be dangerous and unsuitable for swimming[3]. This is due to the fact that runoff from rainfall carries bacteria into surface waters. The increased flow also stirs up bottom sediments where bacteria exist at substantial concentrations. Applying criteria developed in lakes under weather conditions suitable for swimming to small streams under all weather conditions, often when swimming is not physically possible, lacks scientific support.

3. What have been the results of implementing 2000 changes?

According to the draft 2010 Water Quality Assessment, approximately 300 water bodies have been identified by the TCEQ as failing to support recreation because of high bacteria levels[4]. Because much of the data indicating impairment were collected during high-flows when swimming is not safe, and because many of the water bodies listed either do not or cannot support primary contact recreation, there is little confidence that the list indicates legitimate water quality impairments in need of corrective action. When a stream segment is identified as impaired, a total maximum daily load (TMDL) study is required. The end result of a TMDL is a load allocation to each contributor of a substance of concern (e.g. bacteria) so that the total amount entering a water body does not cause it to violate stream standards. These are expensive and time consuming studies. In addition, sources of bacteria are diffuse and often natural in origin (i.e. from wildlife). This makes allocating and/or controlling sources of bacteria very difficult. Therefore, even after a TMDL has been completed, often with no readily-controlled sources identified, a water body can remain listed as impaired for years or even decades. While a

[3] In 2000 PBS&J completed a statewide Bacterial Indicator Study for the TNRCC that used literature on swimming safety to develop a set of conditions for depth, water velocity, clarity and temperature.
[4] TCEQ, February 2010. "Draft 2010 Texas 303(d) List."
http://www.tceq.state.tx.us/assets/public/compliance/monops/water/10twqi/2010_303d.pdf

water body is listed as impaired, no new potential sources of bacteria can be permitted. This has very real implications for local communities and their economies. For instance, a municipal wastewater treatment plant that has been discharging to the same receiving stream for decades with no previous indications that recreation has been impaired, and is in need of an expansion to accommodate growth, will find it difficult to obtain a new permit. This is despite the fact that modern treatment processes remove virtually all bacteria from wastewater effluent. Similarly, a municipality or industry needing to renew an existing permit may be faced with treatment requirements that they cannot afford. This is particularly problematic for rural communities with small tax bases. When legitimate water quality issues exist, the denial of a permit may be appropriate, regardless of inconvenience or expense - depending on the nature and severity of the problem. However the current standards provide little confidence that all of the listed segments are truly impaired.

4. What changes does TCEQ propose to address this issue?

The TCEQ proposes to modify the water quality standards by creating additional categories of the contact recreation use. This will help recognize that 1. Not all types of recreation are appropriate for every body of water and 2. That there exists a tremendous amount of variability between different water-body types (e.g. a small urban drainage ditch and a large reservoir).

Under the proposed standards, primary contact recreation is defined as water recreation activities, such as wading by children, swimming, water skiing, diving, tubing, surfing, and whitewater kayaking, canoeing, and rafting, involving a significant risk of water ingestion. As with the current standards, *it would be assumed that all designated segments have primary contact recreation and would therefore benefit from the highest level of protection, unless it can be demonstrated with a Use Attainability Analysis that a different category of recreational use is more appropriate.*

Two new categories of secondary contact recreation are proposed:

- Secondary contact **recreation 1** applies to water bodies where water recreation can occur, but the nature of the recreation does not involve a significant risk of ingestion such as: fishing, commercial and recreational boating, and limited body contact incidental to shoreline activity. Secondary contact recreation 1 applies to intermittent and perennial freshwaters where site-specific information demonstrates that primary contact recreation has little to no likelihood of occurring.

- Secondary contact **recreation 2** applies to water bodies where water recreation activities do not involve a significant risk of water ingestion and where activities occur less frequently than for secondary contact recreation 1 due to physical characteristics of the water body or limited public access. No water body is presumed to have a use of secondary contact recreation 2.

The current contact recreation geometric mean criterion is 126 *E. coli* per 100 milliliters. This criterion reflects federal guidance published in 1986.

According to the TCEQ, "EPA has indicated that *E. coli* concentrations of up to 206 per 100 milliliters can be considered as protective of contact recreation, and based on that information, TCEQ is proposing to change the criterion for the primary contact recreation category from 126 to 206 colonies per 100 milliliters for *E. coli*. Other states, such as Utah and Colorado, also utilize the 206 *E. coli* per 100 ml to apply to primary contact recreation for some water bodies."

A third change the TCEQ is proposing is to modify the standards attainment procedures to exclude data obtained in high flows. This recognizes that runoff flows tend to have very high concentrations of bacteria at a time when water recreational use tends to be unsafe.

The following table highlights current and proposed water recreation uses.

Contact Classification	Basic Definition	Proposed Change	Benefit of Proposed Change
Primary Contact Recreation	Uses involving a significant risk of ingestion of water, such as: wading by children, swimming, water skiing, diving, tubing, surfing, and whitewater kayaking, canoeing, and rafting	EPA has indicated that geometric mean E. coli concentrations of up to 206 per 100 milliliters can be considered as protective of contact recreation. The TCEQ is proposing to change the criterion for the primary contact recreation category from 126 to 206 colonies per 100 milliliters for E. coli.	There would be a small reduction in the number of listings.
Proposed Secondary Contact Recreation 1	New classification would apply to water bodies where water recreation can occur, but the nature of the recreation does not involve a significant risk of ingestion such as: fishing, commercial and recreational boating, and limited body contact incidental to shoreline activity.	Proposed new classification. Secondary contact recreation 1 applies to intermittent and perennial freshwaters where site-specific information demonstrates that primary contact recreation has little to no likelihood of occurring.	Once a Use Attainability Analysis (UAA) was performed and approved to document the new use, higher criteria would apply which might result in removing the listing.
Proposed Secondary Contact Recreation 2	New classification would apply to water bodies where water recreation activities do not involve a significant risk of water ingestion and where activities occur less frequently than for secondary contact recreation 1 due to physical characteristics of the water body or limited public access.	Proposed new classification.	Once a Use Attainability Analysis (UAA) was performed and approved to document the new use, higher criteria would apply which might result in removing the listing.
Noncontact Recreation	Applies to water bodies where recreation activities do not involve a significant risk of water ingestion	No proposed changes.	

	and where contact recreation uses should not occur because of unsafe conditions. No water body, such as a lake, is presumed to have a use of noncontact recreation.

5. What are the benefits of the proposed changes?

WEAT believes the proposed revisions will achieve a more effective water quality management program for Texas. Ultimately this will benefit the public by getting better environmental benefit from dollars invested in wastewater management.

6. Do the changes proposed amount to "Backsliding"?

No. The changes proposed are not backsliding but an attempt to correct an error that arose from a misapplication of EPA's 1986 criteria development work. Those criteria were developed to be protective of public swimming at lake and coastal beaches in good weather, and did not consider the uses or risks associated with small streams in all weather conditions. Applying the criteria to these situations was an error that needs correcting. A close analogy would be to take criteria developed for safe walking by children around auto traffic, the 20 mph speed limit in school zones, and applying it to all roads at all times. One could expect numerous "listings".

7. Do all bacteria come from wastewater discharges?

No, bacteria can be introduced to the water from many sources:

- bacteria in surface soils that are carried by rainfall runoff,
- bacteria in sediments,
- direct deposition from birds and wildlife,
- growth of bacteria in the water.

Soils contain microbial organisms that break down organic matter to a form where it can be used by other processes. This microbial activity takes place in soils that may have low oxygen levels, similar to mammalian intestines. Basic college soils texts (e.g. Miller, et. al., 1966)[5] note that **a gram of soil may contain .3 to 95 million bacteria cells, or about 500 pounds of bacteria per acre**! It is not surprising that some of these bacteria would be those used as indicators of the presence of intestinal waste.

Another reason that streams sometimes show high bacteria concentrations is that, like soils, stream sediments have high concentrations. The Houston area TMDL study

[5] Miller, CE, LM Turk and HD Foth. 1966. Fundamentals of Soil Science, 4th Ed, Wiley and Sons, NY

http://www.tceq.state.tx.us/assets/public/implementation/water/tmdl/22buffalobayou/22-bbbwbtmdl_adopted.pdf

provides a substantial amount of data on sediment levels as well as wildlife and other sources. These can affect stream concentrations at low flows, when the water is very shallow and in close contact with the sediments; and, also at higher flows, when sediments are scoured and introduced into the water.

8. How are quality levels determined and what are the impacts of runoff to classification?

Water quality monitoring is performed on a periodic basis. Even if only a few of the monitoring samples happen to be collected during or right after a rain, the geometric mean will likely be elevated above the criterion developed in lakes in good weather. This can (and often has) resulted in a determination of non-attainment of the swimming use, 303(d) listing, and a TMDL study. A number of these have been done in rural watersheds with little human activity. Many of these TMDL studies call for a high percentage reduction in bacteria loads, most of which occurs during high flow periods. There is no practical way to achieve a large percentage reduction when natural runoff concentrations and sediment levels are so high. There are cases of lake swimming criteria being used to assess small creeks, where in many cases swimming is not physically practical. Not all bacteria are controllable and efforts to "correct" natural conditions are likely to be unproductive and costly.

9. How were the existing criteria developed?

In 1978 the newly established EPA adopted criteria that had been developed by the US Department of the Interior (NTAC, 1968)[6] to have a means of measuring if the swimmable goal was being attained. Briefly, these criteria for swimming used the fecal coliform test and required a geometric mean of 200 colonies/100 mL of at least five samples collected in 30 days. This is weekly monitoring that would normally be employed at managed swimming beaches. These early criteria adopted by EPA also had a value of 2,000 colonies/100 mL for so-called non-contact activities that had little chance of water ingestion. These include boating or bank fishing. The 2,000 value, 10 times the criterion for swimming, was an assumption. It was not technically based but has been in the regulatory literature for over four decades, has been part of EPA water quality standards, and has not been challenged to our knowledge.

The EPA recognized that the epidemiological basis for the 1968 criteria values was weak and began their own studies in the late 1970s. All of these studies were performed at public beaches (lake or coastal) with nearby wastewater discharges (the source of the bacteria) in good weather

[6] National Technical Advisory Committee. 1968. Water Quality Criteria.

when people were recreating[7]. The studies and the criteria adopted did not consider conditions in small streams or the effects of runoff. The freshwater criterion recommended by EPA (1986), and adopted by Texas in 2000, was a geometric mean of E. coli data of 126/100 mL.

10. What are the Texas Surface Water Quality Standards? (from Texas Commission on Environmental Quality website)

The Texas Surface Water Quality Standards establish explicit goals for the quality of streams, lakes, and bays throughout the state. The Standards are developed to maintain the quality of surface waters in Texas so that it supports public health and enjoyment and protects aquatic life, consistent with the sustainable economic development of the state.

Water quality standards identify appropriate uses for the state's surface waters, including aquatic life, contact or noncontact recreation, and source of public water supply (or drinking water). The criteria for evaluating support of those uses include upper and lower limits for common indicators (criteria) of water quality, such as dissolved oxygen, temperature, pH, dissolved minerals, toxic substances, and bacteria. Statewide standards may be revised on a site-specific basis when sufficient information is available.

11. How can I learn more?

To learn more about the proposed changes to the Texas Surface Water Quality Standards, visit the TCEQ's website at:
http://www.tceq.state.tx.us/permitting/water_quality/stakeholders/2010standards.html

[7] It may interesting to note that it would be almost impossible to repeat the EPA studies today as the conditions necessary for the study, bacteria introduced by human pollution to swimming areas, simply do not exist in the US today.