

## **Beach Bacteria Monitoring Protocol: Saylorville and Red Rock Reservoirs**

**General.** Coliform bacteria, which are found in the intestinal tract of humans and other warm-blooded animals, are frequently used as indicators of fecal contamination, and the possible presence of pathogens in surface waters. Most coliform bacteria are harmless; however, certain strains of *E. coli* can result in deadly gastrointestinal disorders. The U.S. EPA recommends the use of *E. coli* as an indicator organism for fresh waters because studies have shown they are good predictors of gastrointestinal illness. In 2003, the water quality standards of the State of Iowa were modified to reflect the selection of *E. coli* as an indicator organism. The state also modified its beach monitoring program in 2003 based on lessons learned from previous year's monitoring. In an effort to better protect the public health, U.S. EPA recommendations and lessons learned by the State of Iowa were incorporated into a protocol developed for monitoring bacteria at Rock Island District reservoir beaches.

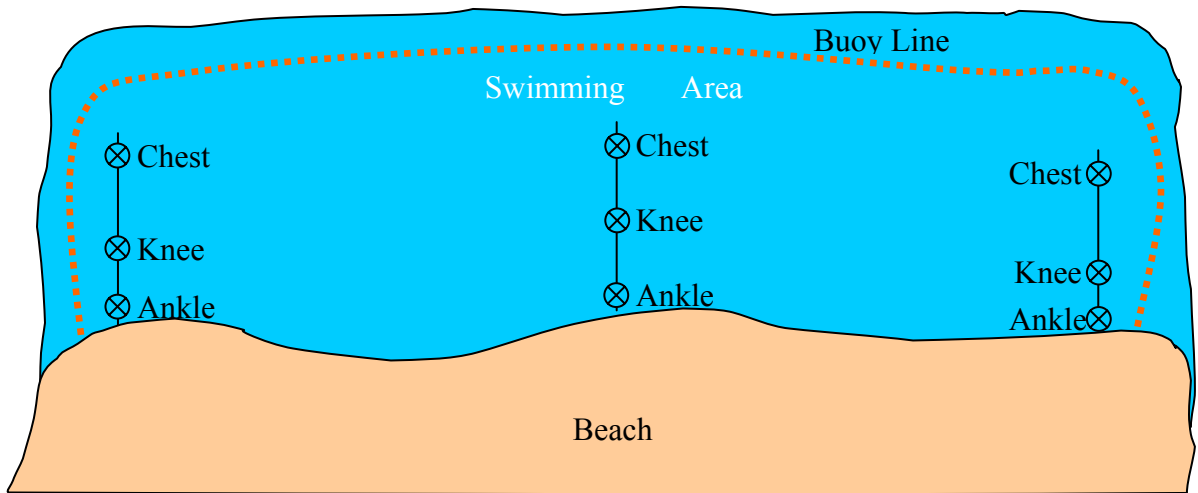
### **Methods.**

#### **Sampling Season.**

Sampling will commence two weeks prior to Memorial Day and extend to the second week following Labor Day. The Oak Grove and Sandpiper Recreation Area beaches at Saylorville Reservoir and the Whitebreast and North Overlook Recreation Area beaches at Red Rock Reservoir will be sampled once per week during the season, on a Monday or Tuesday. An additional sample will be collected during a week if resampling is required due to high bacteria concentrations (see below for criteria for resampling).

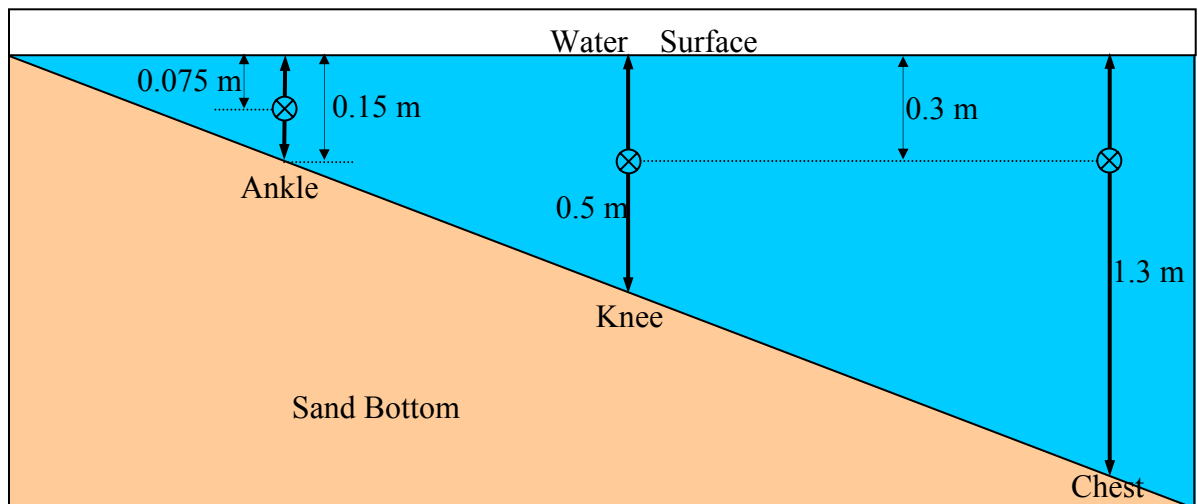
#### **Sample Collection and Analytical Methods.**

A composite sample consisting of nine subsamples will be collected at the beaches. The subsamples will be collected from three points along each of three transects as shown in Figure 1. One transect is near the center of the beach and the remaining transects are near the ends of the beach, about 3 meters from the buoy line/shoreline. The three sampling locations along each transect will be at points approximately ankle-, knee-, and chest-deep. The water and sample depths at these locations are illustrated in Figure 2. A **separate** 100 to 250 ml **sterilized**, wide-mouth, screw-cap, polypropylene sample bottle will be used for collecting **each** subsample. All subsample bottles will be the same size. The downstream transect will be sampled first, starting with the ankle-deep sample and then proceeding to the knee- and finally chest-deep sample. The center transect will be sampled next in the same manner, followed by the upstream transect. Care will be taken by the sampler to not disturb the bottom sediments while wading to the sampling locations. The sampler's body should be positioned downstream from the volume of water to be sampled. The following procedure will be utilized at each sampling location: remove the screw-cap from the bottle, hold the bottle at its base and plunge it mouth-down into the water to the desired



**Figure 1. Plan view of beach sampling locations.**

depth, turn the bottle on its side (position the mouth into the current) and tip it slightly upwards to allow it to fill. Bring the bottle to the surface, pour out a portion of the sample to allow for an air space of 2.5 cm, and then cap immediately. When the three samples from a transect have been collected, place the bottles on ice and proceed to the next transect and repeat the process. After **all** nine subsamples have been collected, they will be poured into a 1 to 2.5 liter **sterilized**, wide-mouth, screw-cap, polypropylene bottle. To accomplish this, each subsample bottle will be inverted five times to allow for



**Figure 2. Cross-sectional view of water depth and sample depth at the three sampling locations on each transect (drawing not to scale).**

complete mixing and the contents will then be immediately poured into the composite bottle. The composite bottle shall be of sufficient size to allow for at least a 2.5 cm air space. The final sample for each beach will be obtained by inverting the composite bottle five times and then immediately pouring a sample into a 100 to 250 ml **sterilized**, wide-mouth, screw-cap, polypropylene bottle (again allowing for at least a 2.5 cm air space for proper mixing). Cap the bottle and place on ice. Perform ancillary measurements (discussed later) at this time. Aseptic technique shall be used during sample collection in

order to avoid sample contamination. Care should be taken at all times to avoid touching the inside of the sample bottles or caps.

Samples shall be stored on ice (below 10°C) until time of analysis. **The holding time must not exceed 24 hours.** Samples will be analyzed for *E. coli* and fecal coliform bacteria according to an EPA approved method as published in the July 21, 2003 Federal Register (*40 CFR Part 136, Part III, Environmental Protection Agency, Guidelines Establishing Test Procedures for the Analysis of Pollutants; Analytical Methods for Biological Pollutants in Ambient Water; Final Rule*).

#### Ancillary Measurements.

One problem with conventional beach monitoring for indicator bacteria is the time lag between sample collection and receipt of the analytical results. Management decisions regarding beach postings/closings are often based on indicator organism data that reflect conditions which were present more than 24 hours earlier. Changes in environmental conditions during this time may affect pathogen numbers, and thus the related health risk. In order to address this time lag, predictive models based on antecedent rainfall, number of beach users, turbidity, etc., have been explored/utilized by some monitoring programs. In an effort to develop a predictive model as part of the Rock Island District beach monitoring program, ancillary measurements (water transparency, number of beach users, number of waterfowl/shorebirds/gulls, wave height, wind speed and direction, and amount of rainfall during the preceding 48 hours) will be recorded during each beach sampling.

Water transparency will be measured at the beaches with a 60 cm transparency tube. The water for this will be collected at the middle/ knee deep location. The transparency tube will be filled to the approximate level where the “Secchi disk” at the bottom of the tube is no longer visible when viewed from directly above. Then, with the tube shaded from the sun, water is drawn from the bottom to the point where the “Secchi disk” first becomes visible. Record the water surface level on the graduated tube.

#### Resampling.

A beach will be resampled if the *E. coli* concentration exceeds the one time maximum of 235 organisms/100 ml. Resampling will be performed as soon as possible following notification of an exceedance. The goal of resampling is to have the analytical results available prior to the weekend, when beach usage is typically high. **Results from resampling will be included in the five consecutive values necessary for calculating the *E. coli* geometric mean.**