

## Bacteria in Our Creeks

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In October 1993, ten signs were posted along the tidal channel of Corte Madera Creek warning against contact with the water between Creekside Park and Highway 101. This followed testing done in the creek near Bacich School in 1992 that showed fecal coliform counts exceeding California water quality objectives for non-contact water recreation. No testing of water quality was done during the period 1992 through 2002, at which time Friends began testing for *E. coli* (in fresh water) and *Enterococcus* (in salt water) in several creeks in our watershed. Our ambitious goal was to identify sources of the bacterial contamination. We conducted six sessions of testing, four in the dry season and two in the wet season. Between the concrete channel and Larkspur Creek, the water in Corte Madera Creek did not meet San Francisco Bay Basin Plan Water Quality Objectives for non-contact recreation during 18 of the 26 testing sessions. (Complete results of Friends' testing can be seen at our website under Projects.) However, we could find no way to identify sources. The failure to achieve our goal of source identification along with the logistical challenges of maintaining the volunteer program and difficulty in finding funding for the lab work led us to stop our program after the summer 2006 testing session.

In 2006, Ross Valley Sanitary District (RVSD) agreed to provide funding for the Healthy Waterways Study. The main objective of the study was to determine in one session of testing if bacterial indicators of human origin were present in surface waters of the Ross Valley. Five sampling locations were selected, all in freshwater sections. These locations were chosen because any bacteria at these sites must have originated in the watershed, not in bay water. A map of the sites is on our website under Projects, Water Quality.

Between 2006 and 2009, a new technique for evaluating bacteria was made commercially available. This technique uses an alternative fecal indicator organism, *Bacteroides*. They make up a significant portion of the fecal bacterial population and their varying characteristics reflect differences in the digestive systems of the host animal. Therefore, the test identifies by species or groups of species (for example, ruminants, which include cattle, goats, sheep, and deer) the source of much of the bacterial contamination. The disadvantage of the currently available *Bacteroides* testing is that the relative quantities of species-specific bacteria are not provided; the result for each species is simply present/not present. The RVSD Board has also decided to continue testing during both wet and dry seasons.

The first season, and first testing conducted jointly with RVSD, Friends, and West Yost Associates was in September 2009. The testing was conducted during the six-week period from 08/11/09 – 09/15/09. This test revealed bacteria of human origin in Larkspur on two of six testings.

Subsequently, RVSD chose to perform another series of tests for the following season; both dry season testing and wet season testing. The dry-season testing was conducted during the six-week period from 9/7/10 – 10/13/10; it revealed bacteria of human origin in Larkspur, Sleepy Hollow, and San Anselmo creeks. Dog-specific bacteria were found in all creeks, pig-specific bacteria in Fairfax Creek, and ruminant-specific bacteria in Larkspur and San Anselmo creeks.

Wet-season testing was conducted from 10/23/10 – 11/30/10. These samples showed human-specific bacteria in most samples (five of seven in Larkspur Creek, five of seven in Corte Madera Creek, seven of



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seven in Sleepy Hollow Creek, six of seven in San Anselmo Creek, and three of seven in Fairfax Creek). Dog-specific bacteria were found in every creek and in all but two samples; pig-specific bacteria were found in at least one sample in each of Larkspur, Corte Madera, Sleepy Hollow, and Fairfax creeks; and ruminant-specific bacteria were found in Corte Madera, Sleepy Hollow, and San Anselmo creeks.

Although multiple sources of bacterial contamination were identified, dog-specific bacteria were found in 94% of the wet-season samples and human-specific bacteria in 55% of the wet season samples. The obvious sources of human fecal material in surface waters are leaking or overflowing sewer mains and sewer laterals (laterals are the private sewer pipes that connect residences to sewer mains). Bacteria delivered by sewer main and lateral leaks to soil in the summer may be mobilized when the water table rises or when infiltrating rainfall carries the bacteria into the groundwater. This could account for the pattern observed in the two seasons of testing. Finally, if broken laterals overflow, usually during wet weather, sewage will enter creeks through storm drains. There may be some human feces washed into creeks in storm water, but that does not seem likely to be a common occurrence.

### **What Can We Do?**

- If you walk a dog, always pick up its waste and dispose of it properly. Don't leave plastic bags of dog waste beside the trail, path, or sidewalk. Carry them with you, dispose of them properly, and plan your route accordingly.
- Have your lateral inspected and replace it if it is in poor condition. RVSD has a grant program that may help pay for it.
- Support RVSD's program to replace its old, leaky sewers. An aggressive program will mean rate increases, but we need clean water in our creeks.
- Urge communities to provide public toilets, especially in areas where there are lots of walkers and cyclists.

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