Instead of running into the water, some beachgoers are running into bright red signs signaling closed beaches due to unsafe swimming conditions. With UW Sea Grant support, UW-Milwaukee environmental toxicologist Sandra McLellan is searching for the source of contaminants along the Lake Michigan coast, hoping to arm management agencies with better information to clean up beaches.

Beach managers post closings when the amount of *Escherichia coli* in the water exceeds standards recommended by the U.S. Environmental Protection Agency. *E. coli* is a bacterium that causes minimal health risk to swimmers, but in high numbers it can indicate the presence of other dangerous bacteria and viruses that can sicken beachgoers.

To find out if pollutants originate from humans, McLellan has been checking for resistance in *E. coli* to antibiotics, which people use and wild animals don’t. Tracing the origins of nonhuman pollutants can be more challenging. Possible sources range from gull droppings in the sand to rainwater that flows to beaches after running off lawns, farms, streets or construction sites, picking up animal waste, fertilizer, pesticides, trash and many other pollutants along the way. To weed through these possibilities, McLellan, a bacterial geneticist, looks for genetic markers in another species of indicator bacteria. Certain types of Bacteroides can be linked to fecal matter from specific host animals, such as cows or humans.

The investigative work doesn’t end in the laboratory. McLellan routinely heads outside to confirm her findings. And often accompanying her on these scientific beachcombing trips are beach managers, city and county officials, and others who know the territory.

One success story is McLellan’s study of Bradford Beach, Milwaukee’s most frequently closed beach in 2004. She found that much of the *E. coli* came from seven stormwater outfalls scattered along the beach, as well as flocks of gulls that congregate along the shore (one gram of gull feces contains 340 million *E. coli* cells). These findings resulted in a joint effort with Milwaukee County to map the stormwater system and develop a proposal to relocate the outfalls away from Bradford Beach. “We have limited funds, so our work needs to be very focused,” said Gary Mick, director of Milwaukee County Environmental Services. “I don’t know how we would address the problems at Bradford Beach without Sandra’s ability to classify certain bacteria so we can tell where they’re coming from.”