Researchers devise hidden dune filters to treat coastal stormwater runoff

March 19 2013

The NC State researchers designed and built two dune filtration systems in Kure Beach, N.C. The systems consist of large, open-bottomed chambers that effectively divert stormwater into dunes, which serve as giant sand filters that remove microbial contaminants from the stormwater. Credit: Michael Burchell, North Carolina State University

When it rains, untreated stormwater can sweep pollutants into coastal

waters, potentially endangering public health. Now researchers from North Carolina State University have developed low-cost filtration systems that are concealed beneath sand dunes and filter out most of the bacteria that can lead to beach closures.

"It was not economically feasible to use a tract of beachfront property to treat stormwater. Instead, we were able to devise a system that could be installed in an area that was not developable – underneath the dunes," says Dr. Michael Burchell, an assistant professor of biological and agricultural engineering at NC State and senior author of a paper on the research.

Specifically, the so-called dune infiltration systems reduced the concentration of bacteria in stormwater runoff by 96 percent.

The dune filtration systems are built under dunes that are covered with

vegetation, making it difficult or impossible to tell that the dunes have been disturbed. A three-year study found that the dune systems reduced the concentration of bacteria in stormwater runoff by 96 percent. Credit: Michael Burchell, North Carolina State University

The researchers designed and built two such systems in Kure Beach, N.C. The systems consist of large, open-bottomed chambers that effectively divert the stormwater into dunes, which serve as giant sand filters. The systems are built under dunes that are covered with vegetation. The researchers then launched a three-year study to see how the filters would perform.

"We needed to know if these filters would affect the flow of ground water, affect dune erosion and whether they would effectively limit bacterial pollution," Burchell says.

The filters "exceeded our expectations" at removing bacterial pollution, Burchell says. And the study found minimal impact on ground water. There were short-term increases in ground water levels during storms, but those increases dissipated in anywhere from a few hours to two weeks.

"And we found that after replanting, the coverage of the dune vegetation actually exceeded what had been there previously – which is important to dune stability," Burchell says.

Burchell's team has since installed a third dune infiltration system in a more developed location to see if the system is able to handle higher flow rates, water volume and concentrations of bacteria. That work is ongoing, but early results are promising.

More information: The paper, "Long-term study of dune infiltration systems to treat coastal stormwater runoff for fecal bacteria," is published in the March 2013 issue of *Ecological Engineering*.

Provided by North Carolina State University