Spatial model offers cost-effective way to identify areas for watershed management

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A spatial model provides a cost-effective way to identify priority areas for implementing voluntary best management practices in an impaired South Texas watershed, according to results from a Texas A&M AgriLife Research and Texas Water Resources Institute study recently published in the *Texas Water Journal*.

"The Spatially Explicit Load Enrichment Calculation Tool, or SELECT, was able to highlight areas of highest concern for bacterial contamination, which provides guidance for individuals and entities that implement best management practices where they would be the most effective," said Dr. Kevin Wagner, Texas Water Resources Institute associate director and a study author.

Wagner said because pathogens are the principal cause of waterbody impairments in Texas and across the U.S., inexpensive and easy-to-use tools are needed to help develop restoration strategies and prioritize application of limited resources.

The Texas Water Journal is an online, peer-reviewed journal published in cooperation with the Texas Water Resources Institute. The institute is part of AgriLife Research, the Texas A&M AgriLife Extension Service and the College of Agriculture and Life Sciences at Texas A&M University.

The paper is the result of an AgriLife Research and institute project conducted in the Copano Bay watershed, which contains the Mission and

Aransas rivers that are impaired for bacteria, according to the state's 2012 list of impaired waters.

The project's goal was to help local watershed stakeholders develop a strategy to address bacterial contamination.

Researchers in Texas A&M's department of biological and agricultural engineering and the Spatial Sciences Laboratory developed SELECT. The tool uses available data to rank potential sources and identify critical areas in a watershed, primarily using land use, population census, agricultural census data and data from wastewater plant discharges in the watershed, according to Dr. R. Karthikeyan, biological and agricultural engineering associate professor, a developer of SELECT and an author on the paper.

"Simulation results using SELECT highlighted subwatersheds within the individual Aransas and Mission rivers watersheds that have the highest potential to contribute E. coli and Enterococcus amounts based on land-use distribution and the eight potential sources assessed," Karthikeyan said.

"However, the amount of bacteria actually reaching the streams depends on several environmental factors including proximity to the creek, bacteria die-off, geomorphology, connectivity of stream network, temperature and other factors," he said.

The potential sources evaluated were cattle, horses, goats, sheep, deer, feral hogs, dogs and humans through on-site sewage facilities and wastewater treatment plants.

Of the eight sources evaluated, the source ranking highest for potential E. coli and Enterococcus loads in both river watersheds was cattle, while septic systems, dogs and deer were the next highest contributors.

Other authors of the paper were Kyna Borel, biological and agricultural engineering research assistant, and Dr. Allen Berthold, a Texas Water Resources Institute research scientist.

Berthold said the study identified a number of limitations of SELECT, including that SELECT does not factor direct deposits of fecal material into the stream, which can have a major impact on instream bacteria concentrations.

"It's important to note that SELECT was not able to fully estimate wildlife contributions because of the unavailability of wildlife data," Berthold said.

He said this is significant as recent studies in similar rural watersheds led by the institute throughout Texas suggest wildlife contribute 42 to 65 percent, while cattle and other domestic animals supply only 14 to 29 percent.

"We are working with biological and agricultural engineering researchers to improve the tool's ability to evaluate wildlife contributions, bacteria transport and actual bacteria concentrations that reach a stream," Berthold said.

Wagner said despite the tool's limitations, its results have proven extremely helpful to the institute and local stakeholders working on the Copano Bay plan to concentrate on implementing voluntary practices in those areas where they are likely to have the greatest impact to improve water quality.

More information: "Estimating E. coli and Enterococcus loads in a coastal Texas watershed": journals.tdl.org/twj/index.php … wj/article/view/7008

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