

**NEWS RELEASE
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**Fecal contamination in popular Montana backcountry area primarily
attributable to wildlife or pack animals**

Using a novel approach to assess levels of fecal contamination in a remote wilderness area, research described in Wilderness & Environmental Medicine found that while humans were not the primary source, people should continue to be vigilant about purifying and drinking water in wilderness areas

Philadelphia, September 22, 2021 – Is increased human visitation to backcountry areas impacting water quality? Investigators analyzed water samples from a suite of backcountry lake outlets in the Absaroka-Beartooth Wilderness Area of Montana for fecal contamination. Combining a traditional fecal bacterial assay and polymerase chain reaction (PCR), researchers found fecal contamination, but in most cases the source does not appear to derive from human feces. The [new method and results](#) are reported in *Wilderness & Environmental Medicine*, published by Elsevier.

With over 1100 km of trails, the Absaroka-Beartooth Wilderness Area in South Central Montana receives high recreational use, including backpacking and travel by horseback. Visits are concentrated around lakes and at water sources near popular summits. “Although the region is remote, increasing human visitation to the Absaroka-Beartooth Wilderness Area has the potential to negatively affect water quality, with particular concern about human-derived fecal contamination,” explained lead author Daniel P. Pendergraph, MS, W.A. Franke College of Forestry and Conservation, University of Montana, Missoula, MT, USA.

The investigators took water samples from 21 remote alpine lake outlets and two snowmelt streams in the area. The samples were tested with standard and widely used fecal bacterial assays that quantified total coliform bacteria and *Escherichia coli* (*E coli*) concentrations. They were also tested with more specific droplet digital PCR assays to amplify and quantify specific genes known to occur in human feces.

Total coliforms were present in all of the lake outlets sampled, and *E coli* were found at 52% of the sites. The highest levels of *E coli* occurred in lake outlets that are popular recreational water sources and accessible to stock animals and human foot traffic.

Human-associated *Bacteroides* were found in low abundances in all sites tested. They were present, but not quantifiable, in 52% (7 of 15 sites) of the sites examined. Only one of the sites had quantifiable, but relatively low, human-associated *Bacteroides*. There were no apparent relationships between landscape type (e.g., open forest, meadow, alpine tundra), elevation, or distance to the trailhead.



Caption: Investigators analyzed water samples from a suite of backcountry lake outlets in the Absaroka-Beartooth Wilderness Area of Montana for fecal contamination. Combining a traditional fecal bacterial assay and polymerase chain reaction (PCR), researchers found fecal contamination, but in most cases the source does not appear to derive from human feces (Credit: Daniel P. Pendergraph).

“Our research suggests that the major sources of total coliform and *E coli* in the Absaroka-Beartooth Wilderness Area could derive from wild animals (deer, rodents, etc.) in addition to livestock, pack animals, or pets brought in by human visitors,” said Mr. Pendergraph.

“These results highlight the utility of combining more traditional assays with emerging microbial source tracking with DNA and PCR based methods,” observed lead investigator Matthew J. Church, PhD, Flathead Lake Biological Station, Division of Biological Sciences, University of Montana, Polson, MT, USA. “We suspect there will be an increasing number of studies that will benefit from this approach.”

The investigators stress that the widespread detection of total coliforms, *Bacteroides*, and *E coli* in the study highlights the importance of purifying water sources in wilderness areas before consumption.

Notes for editors

The article is “Differentiating Sources of Fecal Contamination to Wilderness Waters Using Droplet Digital PCR and Fecal Indicator Bacteria Methods,” by Daniel P. Pendergraph, MS; John Ranieri, BS; Lochlin Ermatinger, BA; Adam Baumann, MS; Alexander L. Metcalf, PhD; Thomas H. DeLuca, PhD; and Matthew J. Church, PhD (<https://doi.org/10.1016/j.wem.2021.04.007>). It appears in *Wilderness & Environmental Medicine*, volume 32, issue 3 (September 2021), published by [Elsevier](#).

The article is openly available at [https://www.wemjournal.org/article/S1080-6032\(21\)00079-X/fulltext](https://www.wemjournal.org/article/S1080-6032(21)00079-X/fulltext).

Full text of the article is also available to credentialed journalists upon request. Contact Theresa Monturano at +1 215 239 3711 or hmsmedia@elsevier.com to obtain copies. Journalists wishing to interview the authors should contact Daniel Pendergraph at +1 847 502 4527 or pendergraphdaniel96@gmail.com.

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About Wilderness & Environmental Medicine

Wilderness & Environmental Medicine (WEM), the official journal of the Wilderness Medical Society, is a peer-reviewed international journal for physicians practicing medicine in austere environments. It is devoted to original scientific and technical contributions on the practice of medicine defined by isolation, extreme natural environments, and limited access to medical help and equipment. Examples of topics covered include high altitude and climbing; hypothermia and cold-induced injuries; diving; drowning; hazardous plants, reptiles, insects, and marine animals; animal attacks; search and rescue. www.wemjournal.org

About the Wilderness Medical Society

Founded in 1983, the Wilderness Medical Society (WMS) is the world's leading organization devoted to wilderness medical challenges. Wilderness medicine topics include expedition and disaster medicine, dive medicine, search and rescue, altitude illness, cold- and heat-related illness, wilderness trauma, and wild animal attacks. WMS explores health risks and safety issues in extreme situations such as mountains, jungles, deserts, caves, marine environments, and space. For more information on the WMS, please visit us at www.wms.org.

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