

# Escherichia coli Source Tracking by DNA Fingerprinting in Diverse Watersheds of Northern New Mexico

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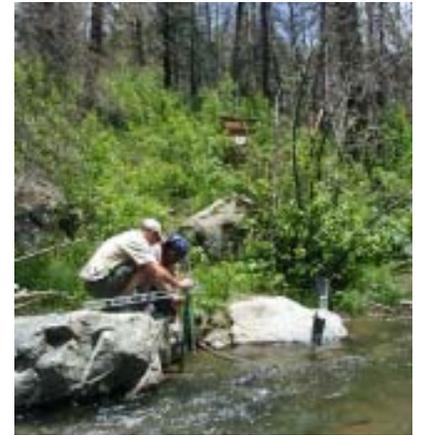
## PURPOSE OF STUDY

The purpose of this project is to identify sources of fecal contamination in surface waters as human or animal by analyzing DNA fingerprints generated using the polymerase chain reaction (PCR) and whole *E. coli* cells. Four stream monitoring sites surrounding the city of Las Vegas, New Mexico, support unique watershed characteristics and are currently monitored for fecal coliform volumes: a section of catastrophically burned forest (Cow Creek near Pecos, NM), a mixed conifer forest (Gallinas River near Montezuma, NM), rangeland prairie (Spring Arroyo northwest of Las Vegas), and commercial/urban land use (Gallinas River below Las Vegas). The forested Gallinas River watershed provides 95 percent of the water supply for 18,000 residents of the city of Las Vegas, and identification of *E. coli* sources as human or animal will allow for better site-specific management practices by the city to better protect the water resource.

## RESULTS

New Mexico Highlands University student Greg Huey and his advisor, Dr. Mike Meyer, analyzed DNA fingerprints from whole *E. coli* cells to identify sources of fecal contamination in surface waters around the city of Las Vegas from four stream monitoring sites. After the researchers collected water samples during an array of environmental conditions, *E. coli* sources were identified using DNA fingerprinting. Source Molecular, Inc. in Gainesville, Florida performed the DNA analysis. In the future, New Mexico Highlands University hopes to acquire the resources to perform DNA fingerprinting in its on-campus facilities.

- Five water samples were submitted for fingerprinting from the Montezuma Monitoring Site. All 20 isolates processed from this location were found to be from nonhuman sources.
- Five water samples were submitted for fingerprinting from the Lower Gallinas Monitoring Site. Of the 29 isolates processed from this location, 19 were from increased discharge during storm events. Of these 19, one to four isolates were from human origin. This suggests that the City of Las Vegas may be experiencing sanitary sewer overflows or unauthorized drainage during storm events.
- Two water samples were submitted for fingerprinting from the Spring Arroyo Monitoring Site. The ten isolates were found to be from nonhuman sources.
- Two samples were submitted for testing from the Cow Creek Monitoring Site. These samples held low, though viable, populations of *E. coli* at collection; however, upon delivery for DNA fingerprinting, the populations had decreased below minimum processing levels and were therefore not analyzed.



New Mexico Highlands University students Greg Huey (left) and Catherine Tabe-Ebob (right) measure flow at the Cow Creek Monitoring Site.

## BENEFITS

- The results of this research will assist the City of Las Vegas in identifying sources of contamination in surface waters as human or nonhuman and facilitate in a proactive development of water quality protection strategies. Results suggest that Las Vegas may be experiencing sanitary sewer overflows or unauthorized drainage during storm events and further testing is strongly encouraged.
- Study results will be shared with interested parties in New Mexico and throughout the Southwest including the City of Las Vegas Water Treatment Department, the Terra y Montes Soil and Water Conservation District of San Miguel County, New Mexico Environment Department, New Mexico Game and Fish Department, U.S. Forest Service, Santa Fe National Forest, Natural Resources Conservation Service, U.S. Geological Survey, and the National Institutes of Health.
- The project may continue under funding from New Mexico Highlands University in the coming year.



Greg Huey concentrates a *Cryptosporidium*/*Giardia* sample for enumeration in lab.

