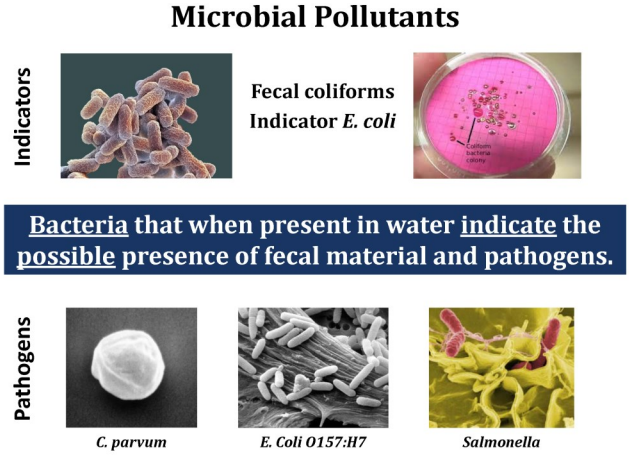
Public Lands Grazing and Water Quality Research

Concerns have been raised that microbial pollution from livestock grazing threatens human health. The concentrations of waterborne fecal indicator bacteria (FIB), such as fecal coliform and indicator *E. coli,* are regulated in an attempt to safeguard public health from pathogens which can pose health risks (i.e., *Cryptosporidium parvum, Giardia intestinalis* assemblage B and C, and *E. coli* O157:H7).

UC Davis and UC Cooperative Extension researchers have worked with the US Forest Service and stakeholders on multiple studies to 1) quantify microbial pollution in surface waters; 2) compare results to regulatory benchmarks; and 3) examine relationships between water quality, environmental conditions, and multiple uses (e.g., grazing, recreation).



In this update, we highlight a study conducted on the Grizzly Valley Grazing Allotment, Plumas National Forest. In this study we examined differences in pathogen and FIB concentrations in grazed and ungrazed meadows to better understand the correlations between cattle and waterborne pathogens.

Sampling water from Grizzly Valley Allotment

Methods

- At the height of the 2011 summer grazing season on the Grizzly Valley Allotment we sampled stream water from Grizzly Creek (open to grazing cattle) and nearby Cow Creek (excluded from cattle access) for a suite of pathogens and FIB.
- We also collected fresh cattle fecal deposits within 30 feet of Grizzly Creek for pathogen and FIB load determination.

Results

- *Salmonella* and *E. coli* O157:H7 were not found in any cattle fecal or stream water samples.
- Only *G. intestinalis* assemblage E (19.5% of samples) and *C. andersoni* (2.4%) were found in cattle feces. These agents present very low pathogenic risk to humans.

- *C. parvum* and *G. intestinalis* assemblage B and C were found in both in grazed and ungrazed stream waters at low concentrations (< 2.8 oocysts/L). These agents can present pathogenic risks to humans.
- Based on these concentrations, ingestion of approximately 2.1 gallons of stream water would present a 50% risk of infection—assuming all detected waterborne oocysts are pathogenic and infectious.
- Because *Cryptosporidium* and *Giardia* found in creek water and cattle feces were different assemblages, the source of protozoa was unlikely to be cattle, and no association was found between fresh bovine fecal loads and concentration of waterborne protozoa.
- FIB regulatory benchmarks were met throughout this study period.

	Cow Manure		Stream Water	
			Grazed	Ungrazed
	# positives out of 41 samples	mean concentration (per gram)	mean concentration (per liter or per 100 mL)	mean concentration (per liter or per 100 mL)
Pathogens				
C. parvum	0	0	2.8	1.1
C. andersoni	1	–[A]	0	0
G. intestinalis assemblage E	8	6,169	0	0
G. intestinalis assemblage B and C	0	0	0.7	2.3
Salmonella spp.	0	0	0	0
E. coli O157:H7	0	0	0	0
Fecal Indicator Bacteria				
Fecal coliforms	41	7,200,000	38	34
Indicator *E. coli*	41	7,000,000	42	23

[A] *Too small to estimate mean.*

Thiptara, A. 2014. The Role of Cattle Grazing Management Practices and Environmental Factors in the Spread of Waterborne Pathogens in California Sierra Nevada Meadows. Ph.D. Dissertation. Graduate Group in Epidemiology, UC Davis. 113 pp.

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