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## The Impact of Cattle Grazing in High Elevation Sierra Nevada Mountain Meadows over Widely Variable Annual Climatic Conditions

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### ABSTRACT

The impact of summer cattle grazing on water quality during three very different climatic years in the Sierra Nevada was investigated. Water year 2009 had near normal precipitation; 2010 had late precipitation and snowmelt; and 2011 had 150% above normal precipitation. Surface waters were tested for pathogenic bacteria indicators fecal coliform, E. coli, and total coliform before and after cattle were released onto summer grazing allotments. Water samples were collected from meadow stream sites up to 6 weeks before and up to 6 weeks after cattle grazing began. Streams passing through ungrazed meadow served as controls. Eight sample sites were between 1694 m and 2273 m in elevation; one site was lower at 1145 m in elevation. Samples were transported within 6 hours to a water analysis laboratory, where samples were analyzed following standardized laboratory methods. Results showed that individual site and total mean concentrations of E. coli in surface waters were within regulatory standards before cattle arrived during each of the 3 study years. After the beginning of grazing, mean E. coli counts increased as follows: 2009 from 8 to 240 CFU/100mL, 2010 from 7 to 561 CFU/10mL; 2011 from 7 to 657 CFU/100mL ( $p < 0.05$  all years). Total coliform bacteria and fecal coliform concentrations showed the same pattern. This study shows that cattle grazing in the high elevation Sierra Nevada results in a significant increase in indicator bacteria. This impact on the watersheds occurs despite widely variable annual climatic conditions.

### KEYWORDS

Water Quality; Sierra Nevada, Mountain Meadows; Livestock Grazing; Cattle, Indicator Bacteria

### Cite this paper

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