Rangeland Watershed Program
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FACT SHEET

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Manure Loading into Streams from Direct Fecal Deposits

Livestock grazing on rangelands can contribute to nonpoint source pollution in streams. Although sediment is generally considered the largest water quality problem from livestock grazing, nutrients and pathogens may also be of concern. The major nutrients coming from cattle are nitrogen (N), phosphorus (P), and potassium (K). The relatively benign Fecal Coliform (FC), and Fecal Streptococci (FS) bacteria are used to indicate the presence of possible pathogens.

To be considered a pollutant, nutrients and pathogens must reach a stream. Nutrients and pathogens can reach the water either by direct deposit or by overland transport during a runoff event. In most semi-arid environments runoff events are infrequent. Therefore, the largest potential for contamination of streams due to grazing depends on livestock density and access to water. The amount of time that livestock spend in or near streams can be variable as shown by studies at the San Joaquin Experimental Range (SJER) in the foothills of the Sierra Nevada Mountains in California and in Eastern Oregon (Table 1). The difference in drinking time in Table 1 may be that cattle drank from a trough at the SJER, and from streams in Eastern Oregon.

In 1989, Oregon researchers observed the daily fecal deposits and amount of time spent in the creek by different classes of cattle and during different seasons in Bear Creek, Crook County, Oregon (Table 2). They found that time spent in the creek, and direct fecal deposits varied by season.

Table 1. Amount of time beef cattle spent drinking water as recorded in studies in California and Eastern Oregon.

Author	Drinking Time min/cow/day	Location
Wagnon 1963	3 to 6	SJER, California
Sneva 1970	17	Eastern Oregon
McInnis 1985	26	Eastern Oregon

Table 2. The amount of time cattle spent in the stream and the number of defecations directly into the stream in Bear Creek, OR. Time in the stream includes drinking, loafing, etc. From Larsen 1989.

Season	Cattle Class	Time Spent in Stream min/cow/day	Instream Fecal Deposit def/cow/day
Summer	cow/calf	11.2	0.41
Fall	cow/calf	3.0	0.19
Fall	bull	2.3	0.00
Winter	cow	5.6	0.20
Winter	yearling		0.14
Spring	cow/calf	3.9	0.17
	Average	5.2	0.19

Using the values in Table 2 with estimates of defecation rates, nutrient content, and bacteria concentration in manure (Table 3) we estimated the potential nutrient and bacterial loading directly into the stream (Table 4).

Table 3. The amount of manure, nitrogen (N), phosphorus (P), potassium (K), fecal coliform (FC) and fecal streptococci (FS), produced by beef cattle. Based on one 1,000 lb. beef cow.

12 defecations/day
60 lbs manure/day (88% water)
5 lbs manure/defecation (88% water)
0.34 lb N/day
0.11 lb P/day
0.24 lb K/day
$3.84*10^{10}$ FC/day
$7.2*10^{8}$ FS/day

Sources: Johnstone-Wallace and Kennedy 1944
Moore and Willrich 1982
Moore et al. 1988

These estimates in Table 4 indicate that the amount of manure loading into a stream for any given day, season, or year from one cow is quite small. However, there may still be a concern about pollution. As much as 95% of deposited manure will settle to the bottom of the stream within the first 50 meters (Biskie et al. 1988). The bacteria in the sediment may remain alive for several weeks (Sherer et al. 1992). Less is known about what happens to the nutrients that enter the stream in the manure.

Therefore, daily inputs from directly deposited feces may accumulate on the stream bottom. Any disturbance, such as peak flows, can resuspend sediment creating high concentrations of bacteria, and possibly nutrients for a short period of time. The higher the density of livestock, the higher the concentration of pollution.

Any practice that reduces the amount of time cattle spend in a stream, and hence reduces the manure loading, will decrease the potential for adverse affects of water pollution from grazing livestock.

Table 4. Estimates of the amount of manure, fecal coliform (FC), fecal streptococci (FS), nitrogen (N), phosphorus (P), and potassium (K) getting into the stream from grazing cattle based on one 1,000 lb beef cow.

Season	Manure		Bacteria		Nutrients		
	wet (lb)	dry (lb)	FC (no.)	FS (no.)	N (lb)	P (lb)	K (lb)
Per Day							
Summer	2.05	0.25	$1.3*10^{9}$	$2.4*10^{7}$	0.012	0.004	0.008
Fall	0.95	0.11	$6.0*10^{8}$	$1.1*10^{7}$	0.005	0.002	0.004
Winter	1.00	0.12	$5.4*10^{8}$	$1.2*10^{7}$	0.006	0.002	0.004
Spring	0.85	0.10	$5.4*10^{8}$	$1.0*10^{7}$	0.005	0.002	0.003
Per Season							
Summer	187	22.4	$1.2*10^{11}$	$2.2*10^{9}$	1.1	0.3	0.7
Fall	87	10.4	$5.5*10^{10}$	$1.0*10^{9}$	0.5	0.2	0.3
Winter	91	11.0	$5.8*10^{10}$	$1.1*10^{9}$	0.5	0.2	0.4
Spring	78	9.3	$4.9*10^{10}$	$9.1*10^{8}$	0.4	0.1	0.3
Per Year							
	443	53	$2.8*10^{11}$	$5.2*10^{9}$	2.5	0.8	1.8

Royce Larsen, Department of Agronomy & Range Science, University of California, Davis, CA.

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