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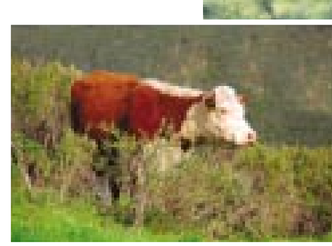
Cattle - Grazing our watersheds

A STUDY of water quality in streams in the North Okanagan area watersheds that are grazed by cattle each summer.



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A STUDY of water quality in streams in the North Okanagan area watersheds that are grazed by cattle each summer.

The North Okanagan Livestock Association wishes to acknowledge the funding support of the Agriculture Environment Partnership Initiative, a joint venture of Agriculture and Agri-Food Canada, the British Columbia Ministry of Agriculture, Food and Fisheries and the Investment Agriculture Foundation of British Columbia.

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Cattle Grazing our watersheds

WATER quality is a priority when dealing with water safety.

It is a normal practice to regularly monitor water quality for potential contaminant's such as *Escherichia coli (E. coli).* Water coming from our watersheds destined for human consumption is checked on a regular basis. Many times when contaminant's such as *E. coli* are found and cattle are or have been present in the watershed area, they have been blamed for the contamination.

RECENT studies and research of water quality conducted in North Okanagan streams has indicated that just because cattle are present, it does not necessarily mean that they are the main contributors of fecal contaminant's. Of the 4 watersheds used for the study, 3 had a cattle grazing, and 1 had only minimal cattle presence (South Fortune Creek) due to steep heavily wooded terrain.

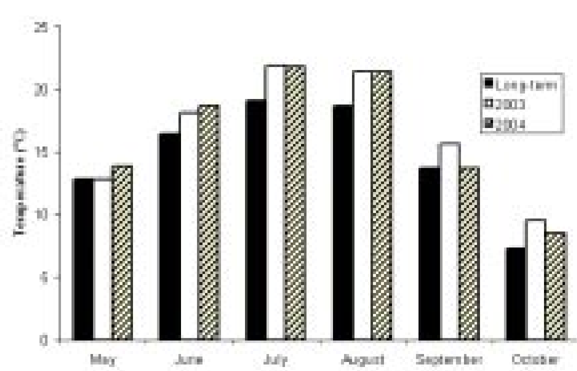

Figure 1.
Long-term (1971-2000) daily average temperature (ºC) and 2003 and 2004 daily average temperatures.

THE STUDY was conducted June to October 2003 and May to October 2004, and went beyond typical water quality monitoring and testing. What was different was that this study not only looked at how much *E. coli* was in the streams, but it also looked at where the *E. coli* was coming from in the watershed. The researchers have taken the next step through DNA source tracking technology to determine the actual contributor of the *E. coli* (i.e. was it human, rodent, birds, coyote, livestock etc.).

RESULTS

DAILY AVERAGE TEMPERATURES were generally higher in 2003 and 2004 than the long-term averages (Figure 1). Precipitation in 2003 was substantially lower than the long-term average (Figure 2). Precipitation in May and June of 2004 was similar to the long-term average, however, July was lower, and August through to October was higher. Climate can influence animal behaviour, and animals will be more attracted to riparian areas during drier, hotter seasons.

SEVERAL studies have evaluated the effectiveness of having off-stream water developments as alternatives to livestock drinking directly from a streams or fencing out riparian areas. Off-stream watering areas were shown to significantly reduce the time spent by livestock in riparian areas by more than 90%. Reducing the amount of time cattle spend in or near the stream, would place the majority of cattle defecation away from the stream and therefore decrease the amount of fecal pollution entering the stream.

Salt block placement away from riparian corridors is an effective management tool utilized by ranchers.

These studies suggest that off-stream watering is a viable alternative to total exclusion fencing along stream systems for improving water quality.

WE SHOULD not become complacent because wildlife contributes the largest amount of fecal bacteria to the watershed. We still need to understand what percentages of pathogens are associated with various livestock and wildlife species. Research studies are very important for resolving issues because scientific data can be shown which is much more valuable than making assumptions on what is going on.

If we want to help improve water quality we need good management practices within watersheds, and we need to work cooperatively on ways of solving issues.

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Table 1. Sum of fecal coliform (FC) counts for each site on each stream for 2003 and 2004.

Creek	Year	Site	FC
BX	2003	headwaters	86
		Mid-site	1567
		Lowersite	1050
	2004	headwaters	52
		Mid-site	813
		Lowersite	1365
Deer	2003	headwaters	74
		Mid-site	4600
		Lowersite	1413
	2004	headwaters	80
		Mid-site	2618
		Lowersite	1530
Duteau	2003	headwaters	283
		Mid-site	1839
		Lowersite	1662
	2004	headwaters	149
		Mid-site	1950
		Lowersite	2037
S. Fortune	2003	headwaters	87
		Lowersite	52
	2004	headwaters	129
		Lowersite	465

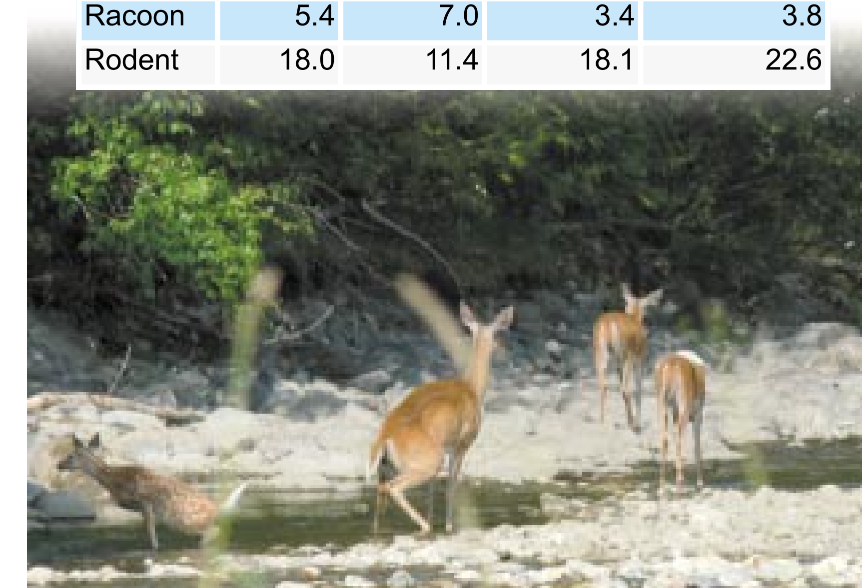
THE PROTECTION of water from waterborne pathogens requires understanding and management of not only livestock in a watershed, but also the wildlife populations. DNA source tracking does identify sources of fecal contamination which is useful information for watershed management.

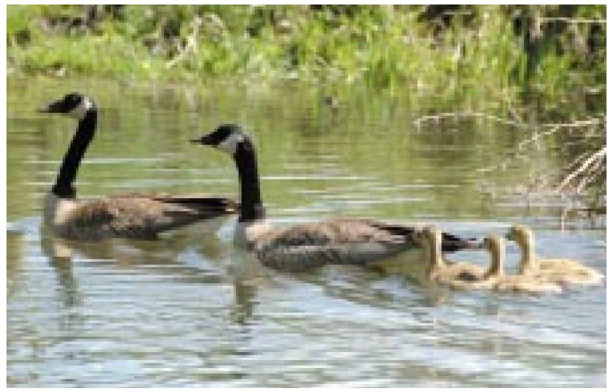
Table 2. Percent of *E. coli* classified by source and stream for 2003 and 2004.

Note: The *E. coli* measured for this study is the general group of *E. coli* not the pathogenic *E. coli* O157:H7 that was found in Walkerton, Ontario.

THERE ARE SEVERAL REVIEWS and guides for livestock grazing in riparian areas. Most of these reviews and guidelines were developed before DNA source tracking was available and reductions in bacterial loading were assumed to come from removing livestock from the area. Each of these guides discusses the tools available to ranchers, with a caveat being that every situation is different. A couple key strategies for reducing the impacts of livestock on water quality are to manage uplands for palatable grazing opportunities and to provide off-stream watering.

	BX	Deer	Duteau	S. Fortune
2003				
Avian	26.5	10.1	21.4	40.7
Bear	7.8	17.0	6.0	5.7
Bovine	1.3	9.0	9.2	4.9
Canine	24.3	16.7	20.3	14.1
Deer/Elk	19.1	21.1	28.3	12.5
Feline	3.7	<1	1.7	1.1
Horse	3.1	<1	<1	0
Human	<1	1.7	<1	0
Moose	0	0	0	<1
Rabbit	<1	<1	0	<1
Racoon	2.9	1.4	3.1	2.3
Rodent	7.8	5.9	5.8	13.3
Squirrel	<1	0	0	<1
Unknown	2.9	16.1	3.2	3.8
Sum	100	100	100	100
2004				
Avian	24.3	28.1	24.7	32.0
Bear	5.2	4.3	8.7	7.9
Bovine	19.1	20.0	19.9	9.4
Canine	6.1	11.2	8.4	6.8
Deer/Elk	6.9	6.4	9.3	11.3
Feline	0	0	<1	0
Horse	1.1	0	0	0
Human	<1	<1	<1	0
Moose	1.9	4.3	<1	1.5
Rabbit	<1	<1	<1	0
Racoon	5.4	7.0	3.4	3.8
Rodent	18.0	11.4	18.1	22.6





Summary of sources

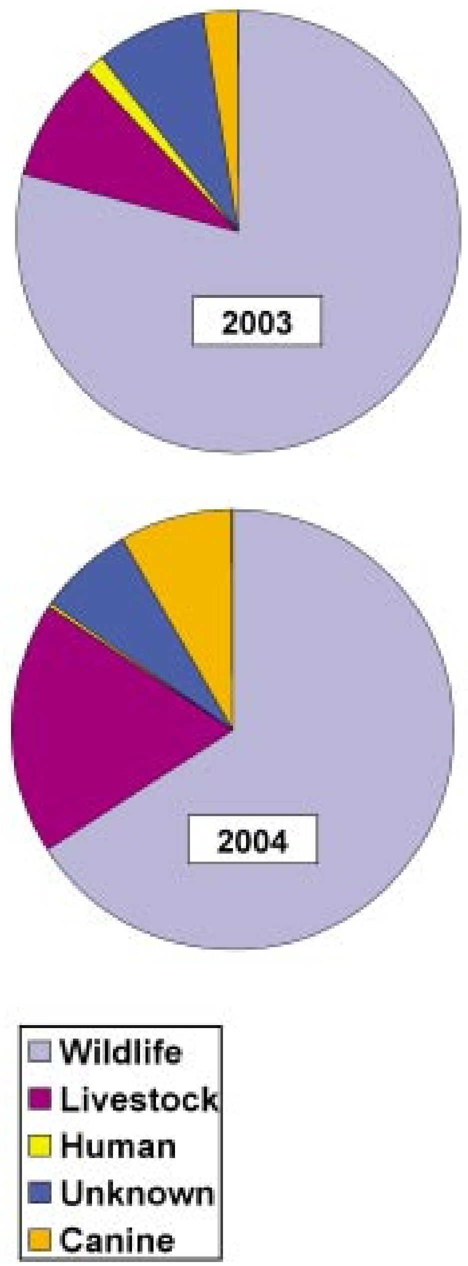


Figure 3. Pie-charts of main sources of *E. coli* for 2003 and 2004. Note: Canine was separated from wildlife because although a large portion would be from coyote and some wolf, it could also include domestic dog.

WATER QUALITY SAMPLING occurred every 2 weeks from June to October in 2003, and May to September 2004. One hundred bacterial water samples were collected at several sites on each of 4 streams each year for 2003 and 2004.

OVERALL, the mid - and lower elevation sites for each stream tended to have higher fecal coliform counts than the head-waters site, with the exception of S. Fortune Creek (Table 1). There tended to be higher fecal coliform counts in 2003 versus 2004 for Deer and BX Creeks, whereas there tended to be higher fecal coliform counts in 2004 versus 2003 for Duteau and S. Fortune Creeks.

THIS STUDY found that a wide range of *E. coli* sources were found in most samples taken over both years. The majority of *E. coli* classified in 2003 came from wildlife sources including deer/elk (22.1 %), avian (birds) (21.5 %), and canine (coyotes, dogs, wolves) (19.9 %) (Table 2). In 2003, cattle contributed between 1.3 to 9.2% of the *E. coli* measured depending on the stream. In 2004, the majority of *E. coli* classified came from avian (26.4 %), cattle (18.3 %), and rodent (16.9 %). These results demonstrate that the main contributors of fecal pollution shift from one year to another. However, overall, wildlife contributed the majority of *E. coli* in 2003 (> 84 %) and in 2004 (> 73 %) to the streams (Figure 3).

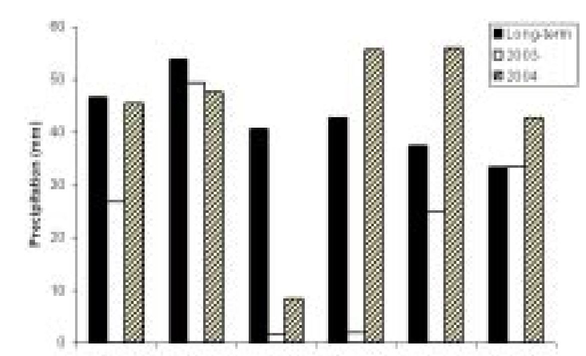


Figure 2.
Long-term (1971-2000) average monthly pre-cipitation (mm) and 2003 and 2004 monthly average precipitation.

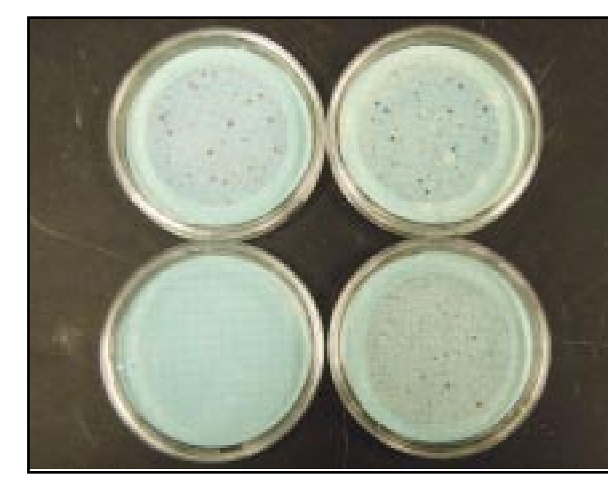


Photo of plates with *E. coli* (blue colour) and fecal coliform colonies (red colour).