

# Patterns of E.coli Contamination in Public Land Streams related to the presence of range-cattle.

SEPT 2013

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## Summary:

This report is a follow-up to a 2009 report: *E.Coli Counts in Dry-land Streams.....*

<http://www.boundaryalliance.org/ecolireport2009.pdf>

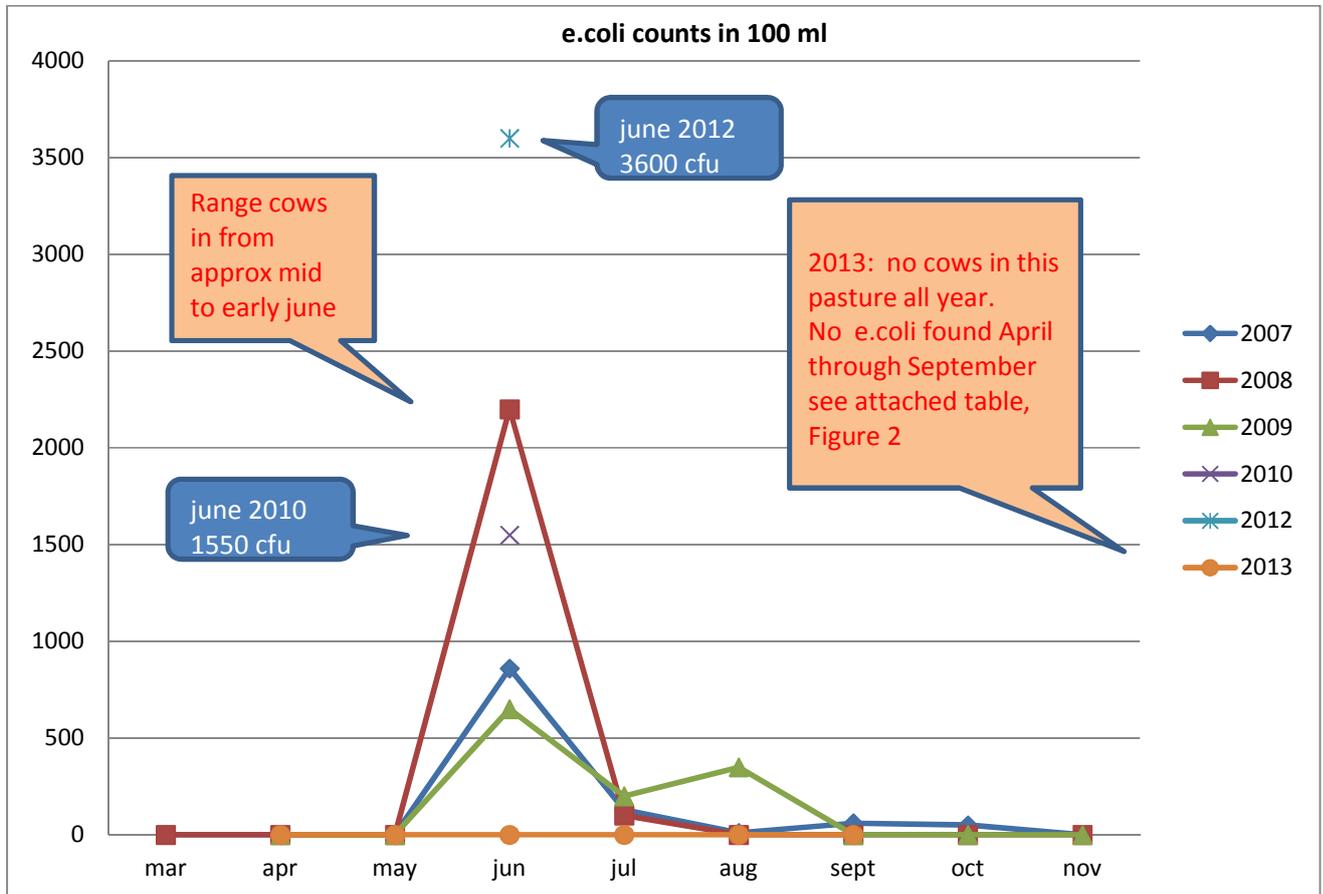
In which four dry-land streams in the Boundary area, BC were tested in 2007 through 2009 for e.coli counts before, during and after arrival and departure of range-cows. These streams and test locations are all located on Public Land where the Ministry of Forests and Range oversees and regulates range use. One of those streams is in an area where cows have been excluded in 2013 due to an ongoing (so-called) Ecosystem Restoration, giving an opportunity to test for E.coli this year in the absence of cattle. Sampling in 2013 began in April and has continued monthly including September 2013.

The E.coli counts April through September 2013 are nil and have been shown in the following Chart, Figure 1 and Table, Figure2. The Chart and table also show the previous monthly results for 2007 through 2009 and spot checks June 2010 and June 2012 with E.coli counts peaking in the June period shortly after the usual introduction of range cattle.

These new results further reflect patterns shown in the previous report that indicated that E.coli counts are almost entirely related to range-cattle presence or absence and that E.coli counts attributable to wildlife (in this and similar dry-land areas) are negligible or nil.

Our previous 2009 Report noted that our findings were contrary to the “preferred belief” of Range Branch, Forest & Range Evaluation Program and ranchers, ‘that cattle are not primarily responsible for e.coli contamination in dry-land streams.’ Our findings contradict fundamental assumptions of Range Use Planning, Practices & oversight.

**Figure 1:** Line chart showing e.coli counts in Johnstone Creek



**Figure 2:** table of E.coli counts in Johnstone Creek as shown in Figure 1

**E.coli counts in 100 ml**

	2007	2008	2009	2010	2012	2013
mar	0	0				
apr	0	0	0			0
may	0	0	0			0
jun	860	2200	650	1550	3600	0
jul	130	100	200			0
aug	10	0	350			0
sept	60	0	0			0
oct	50	0	0			
nov	0	0	0			

## **Background:**

An overview of potential sources of contamination and the factors in play in this dry-land area were included in our 2009 report <http://www.boundaryalliance.org/ecolireport2009.pdf> and are partially repeated in the following:

*Factors generally affecting contamination include weather events that can flush distant fecal deposits (from wild or domestic animals, birds, rodents,) into water courses or water bodies. Overflow from sewage plants or leaking septic systems and leaching or wash-off of manures, and densities of wild or domestic animals with direct access to water bodies. Other factors include dilution by stream volumes and "purity" and volume of receiving waters. Much of the research and statistics available are reflective of areas where most or all of the above factors are in play.*

*In our "dry-land" arid area, which we have in common with much of the American west, fewer of these factors are in play. Here, where the heavy rainfall or rapid melt required to transport distant fecal deposits seldom occurs, where no sewage plants are discharging to upland streams and where water sampling is taken above human settlement, only a few factors are usually in play.*

*The primary factors affecting these streams are therefore:*

- a. Amount of time spent in or about the stream by wildlife and cattle.*
- b. Density of fecal contributing populations and relative fecal volumes of contributing populations.*
- c. Stream volumes, gradient and turbulence affecting dilution and deposition.*

*Re: (a) where few or no working water sources have been constructed or maintained, cattle can spend 80% or more of their time in riparian zones even though these zones occupy only about 2% of the range. In most of these riparian zones their presence is apparent in the form of pugged and hummocked areas and fecal deposits that significantly outnumber or obscure evidence of other wildlife presence. That unfettered access also means that fecal contaminants that might settle out in sediments are constantly redisturbed and redistributed into streams.*

*Although studies have shown that off-stream water sources can reduce cattle impacts on streams by 80% to 90%, little or no effort has been made over the years by ranchers or Range Branch to reduce the impacts on riparian zones. As a result, water quality is degraded, streams are degraded and riparian vegetation is overgrazed. The habits of cattle, fecal deposits and loafing in streams has been well studied and an abundance of studies have identified the benefits of off-stream watering devices to riparian zones, water quality and the health of cattle.*

*Re: (b) to state the obvious; fecal volumes are in proportion to volume of feed consumed. When it is observed that wildlife use of riparian zones is occasional and fleeting, compared to cattle; when testing for fecal contamination in stream water shows background levels, (before cattle arrive) to be low or nonexistent, wildlife numbers are seen to be fairly steady seasonally, except for increased winter use in some areas by ungulates, it is reasonable to expect that the large animals (cattle) in the watershed, are responsible for the great majority of fecal contamination that shows up in streams shortly after their arrival.*

*Re: (c) rapid melt or heavy rain could affect dilution, particularly in spring, could affect water testing results by diluting "background levels". No such events occurred in the week(s) prior to our testing.*

*Turbulence at all testing was very low.*

Our 2010 article/letter (sent to the Ministers of Forest & Range, Agriculture and Environment) <http://www.boundaryalliance.org/rangecattleproblem.pdf> expanded on the "preferred beliefs" of government staffers and industry spokespersons and addressed the irrelevancy of studies on (BST) Biological Source Tracking, (a.k.a. Microbial Source Tracking or MST), done in the Vernon B. C. area, to other watersheds and our dry-land streams. Extract follows:

*Early in our sampling/testing program the trends were obvious. We contacted Forest & Range Evaluation Program (FREP) in the expectation that they were doing some water testing and could provide comparative information as per the expectations raised by their Mission Statement: **"To be a world leader in resource stewardship monitoring and effectiveness evaluations; providing the science-based information needed for decision making and continuous improvement of British Columbia's Forest and Range practices, polices and legislation"**. We found that FREP did no water testing, Forest Practices Board, the same. Our concerns were passed on to several sources in FREP who all responded with some or all of the following:*

- a) DNA "source-tracking" (BST/MST) has established that cattle are not the primary source of e-coli in streams.*
- b) Coliform counts naturally increase in warmer weather.*
- c) Water samples taken have high variability in e-coli; therefore "one time samples" unreliable.*
- d) Range Branch Act & protections or practices only applicable to "Community Watersheds"*

*We will deal with these "preferred beliefs" in turn.*

*Re (a) All FREP and some additional Ministry of Environment sources referred us to some DNA based "source tracking" studies by C Meays et al conducted in recent years (published in 2006 from sampling in 2003 & 2004.) in the Vernon Watershed. We were advised that these studies showed that cattle were not the major contamination source.*

*Our own enquiries found the Vernon Water District (VWD) had had repeated water quality problems over the years resulting in numerous boil-water advisories. The VWD, believing over the years that range-cattle use in the watersheds was the likely source of the e-coli contamination, was successful in getting various extensive and untypical initiatives in place to restrict stream access, and provide alternate off-stream water sources for cattle.*

*Meay's studies took place after these initiatives. We visited the watershed area (used by range cattle) in 2007 and saw numerous natural water sources (with no hydrological connection to the streams, in that season) where cattle had water access without going near streams. On our mid September visit we saw few cattle and very little cropping impact. In subsequent conversation with Meay's who was doing further research in the area that year, Meay's indicated that cattle presence appeared to about the same as during the DNA testing. What becomes apparent from this is that a study in a non-typical area where much work has been done to keep cattle away*

*from streams, where cattle presence appears to be at a much lower than usual stocking rate, is being touted as proof that cattle are not a problem. Some of the areas sampled in this study were not even range areas. These studies are being used to “demonstrate” to the willing believers, the cattle interests and various ministry staff who should know better, that cattle are not a problem and that the Vernon studies can be widely applied. The truth is that the Vernon studies have no useful relevance to our dry-land conditions, and the typical range-cow populations.*

*For those who follow TV’s CSI shows, DNA testing is likely to be regarded as absolute proof. Microbial Source Tracking (MST) or Bacterial Source Tracking (BST) however, is very different from CSI type determinations. While MST/BST show great promise and have some broad-strokes applications, it would be useful to consider summary comments from an Environment Canada Workshop: 2005 “recent studies were perceived to have placed a wet blanket on Microbial Source Tracking, particularly for large watersheds with complex sources of fecal contamination,” “there was a growing recognition of the limitations of existing MST methods, and that initial optimistic expectations in the early days, need to be tempered.”*

*Another authority on MST has stated that: “despite the political realities and management-level convenience of source definitions such as ‘wildlife’ and ‘livestock’, for some markers it may not be scientifically defensible to use such artificial definitions.” “the capability of any MST method to quantitatively measure the relative contributions of fecal contamination to a water sample has not yet been convincingly demonstrated.”*

*The Meay’s studies which seemed to fit the preferred belief of cattlemen and those who administer range use, was of course primarily financed by Cattlemen.*

*Re (b) partially true, but misleading. In our sampling we found that (non fecal) general coliforms increased rapidly in summer and as ‘general’ coliforms are usually associated with decaying matter e.g. vegetation, these increases are expected in warmer weather. We found no evidence that e-coli increased by any natural process other than by deposition. When cattle were in areas for brief periods in spring or early summer (with attendant high e-coli counts) e-coli counts would later diminish over summer to near zero. While there are some indications in the literature that under some (rare) circumstances e-coli can naturally increase, we found no evidence of it here.*

*Re (c) We agree variability is a factor. It is our opinion however that potential variability is used by some as an excuse not to do any testing, claiming that any “meaningful” testing would require multiple sampling over multiple time periods. This claim is followed by the suggestion that the various Ministries lack the resources to do such testing. As we were aware of this mindset during our sampling we collected a number of samples at different times. On average we found approx 16% variation in e-coli counts. At very low contamination levels this would suggest, for example, that such variation might make one sample meet drinking water standards and another fail. This would be of some interest to a property owner trying to provide evidence of potability, however on the range it could mean e-coli readings of 1000 CFU or more, or another sample that might be 1100 or 1200 CFU’s. A rough count at these typical levels is completely adequate to demonstrate that water quality is being impaired by range use.*

*Re (d) Despite the Range Act and other Objectives and Plans that mention protecting Community Water Sheds, (with the implication that these Acts, Objectives and Plans, are not required to protect other watersheds from which individuals draw water) your Ministries know that such*

*language is an arbitrary designation that means nothing to Public Health or public opinion. The Forest Practices Board has dealt with this issue at some length, has stated that there is no reason for that arbitrary designation and that all watersheds should be protected. As with so many recommendations of FPB and FREP, that recommendation has been ignored. The organization formed to provide guidelines and oversight of logging on private lands dealt with the issue more recently and decided that there were no justifications for treating "Community" and other watersheds differently. If your Ministries continue to ignore the reality of contaminated water and fail to adequately prevent that contamination and fail to adequately test for contamination, you as Ministers are assuming a moral and probably legal responsibility for any outcomes. You might wish to give some thought to situations such as Walkerton and to the United Nations Environment Program which indicated recently that "dirty water kills more than war" and that: "over half the world's hospital beds are occupied with people suffering illnesses linked with contaminated water." While we are obviously not facing the same degree of risk as many countries, there has been a trend in Range Management of ignoring the risks being imposed on an unwitting public, and of failing to incorporate recommendations of FREP and FPB that would go some way to reduce the risks and of dismissing public concerns.*

*We have instead in recent years seen Range Plan changes that have eased requirements and guidelines, making water contamination more likely.*

Following the publication of our own article/letter **The Problem with Range Cattle** in 2010 <http://www.boundaryalliance.org/rangecattleproblem.pdf> in which we stated that the Meay's Reports were irrelevant to any watershed other than watersheds in those studies and that that the Meays Reports were primarily funded by cattlemen, cattlemen and a spokesperson for the B.C. Cattlemen's Association took issue with those statements and we were accused off a variety of sins in a series of public comments/letters.

However, the Meay's Reports themselves note that the Vernon findings should not be applied to other watersheds (a point others in the source tracking field have made) and that the Reports were primarily funded by the British Columbia Beef Cattle Industry Development Fund. (BCIDF)

The BCIDF Fund is mainly interest available from a Trust Fund given to the industry by the B.C. Government. Use of the fund is entirely at the discretion of CIDC.

BCIDF funding is administered by the Cattle Industry Development Council (CIDC). The CIDC is composed of members selected by various Cattle organizations (including dairy) with half of the members selected by the B.C. Cattlemen's Association. The other half may well be members of the Association. CIDC handles and approves funding from the BCID Fund. When CIDC approves a funding application, most funding purposes automatically qualify (due to other agreements) for additional funding from various Government sources. It is the vetting of applications and approval of spending by CIDC that leverages and triggers these 'matching initiatives' and this additional funding sources would not be available except for the CIDC approvals.

It should be no surprise that the Meay's Reports credited BCIDF as the 'primary' funder.

An approximate breakdown of funding of the Meay's Reports is as follows:

B.C Cattle Development Fund (BCIDF)	197, 000
Agriculture & Agri-Food Canada's Matching Initiative	197,000
Agriculture Environment Partnership Initiative (Federal)	49,000
B.C. Ministry of Environment	12,000
Misc other smaller funding or in-kind contributions	amounts not known

Sources: BCIDF Grants Records & [ijc.org](http://ijc.org).

It is interesting to note that despite the taxpayer money which flowed to this project after CIDC approved the initial funding, the two Reports that resulted are not publicly and openly available on the web. Reports are available only through payment or subscription. Clearly taxpayer supported studies such as these should be publicly and freely available.

The Cattlemen's Association (BCCA) would claim that the Association paid no funds to the work (we never claimed they did) and omitted any mention of the crucial and primary role of BCID and the CIDC Fund, in claiming that funding came mainly from various government agencies.

BCCA and ranchers 'invented' additional scenarios from what they chose to think was 'implied' by our comments and having constructed some "straw-men," went on to try to knock them down. Such red-herrings are common when people are looking to avoid the substantive findings that might impact their interests and are as misleading as attempts to misrepresent the origins and primary sources of funding. We note that BCCA and BCIDF/CIDC operate from the same address and phone number in Kamloops.

## **Conclusions:**

Our 2013 results together with previous results provide compelling evidence that E.coli contamination in this stream is principally linked to the presence or absence of range cows. Earlier results in the 2009 Report and numerous other periodic tests support that proposal in this and other dry-land streams. In our 2009 Report ***E.Coli Counts in Dry-land Streams***....we withheld publication of the stream locations not wishing to identify particular Range Tenures as we viewed our E.coli testing results as representative of typical dry-land streams in the Boundary. Information on the locations was provided to several Government Agencies and to Public Health.

In 2013 we have identified one of the streams, Johnstone Creek, as our testing location is in a Provincial Park. The public water supply at that Park has been signposted for the last couple of years with a boil water advisory. We are told that this does not reflect findings of contamination in water samples from the Park well, but awareness that the well does not meet current construction standards. However Government Agencies have posted no alert as to stream contamination and risks to Park users who may consider the stream (which appears to be pristine) to be an alternative to the "Boil Water" source at the well.

Range Management and practices claim to follow a number of essential guidelines. The guidelines for water and forage resources require that **practices implemented maintain or improve the resources**. These guidelines are supposedly specifically addressed in the Range Plans for each tenure. It has been the practice of Forestry & Range Management to refuse to provide Range Plans to interested and affected people and to refuse to have interested/affected parties have any opportunity to review or have input into new or renewing Range Plans as is required of other tenure holders using public land, e.g. Forest Companies and Wood Lot tenure holders.

A few years ago Government moved from "prescriptive" Forest & Range Management to "Results Based" management. It may seem redundant to suggest that a 'results based' system needs to measure results. In the case of the water resource that means monitoring, however no Government Agency including Min of Forests & Range monitors the water resource. Were they doing so we expect that they would find the same results we have found in our (easily replicable) testing program. It is likely that Government is well aware that range use will not, cannot and has not led to "**Maintenance or improvement of the resource,**" and is avoiding any information contrary to its preferred belief. As previously mentioned range cows have been temporarily held out of the 'pasture' immediately upstream of our test location in the Park because of a so called Ecosystem Restoration project which will spend several hundred thousand dollars (public funds) to repair and supposedly improve a degraded

pasture, a mix of forest and grassland. The degraded state of this pasture is in our opinion largely the result of cattle presence; (to be detailed in a separate report) a conclusion also informed by comparisons with nearby private lands where cattle grazing has not occurred.

The 'repairs' are largely directed at improving grass for the early season use of range cows. In order to do this a variety of attributes favourable to wildlife (particularly ungulates) have been impacted resulting in substantially reduced snow interception cover, thermal cover, connectivity and security cover in a valued ungulate winter range and wildlife corridor.

While this report deals primarily with water quality impacts, degradation of water quality is frequently associated with degraded riparian zones, grasslands and pastures. Clearly, Range Management Objectives that require water and forage and other "**resources be maintained or improved**" are failing and that failure is evident in numerous range tenures.

A giant 'elephant in the room' (or floating over compromised public land) is the public cost of maintaining range use. The cost of the above project can be measured against range use rents for the pasture of approx \$ 128.00.PA.

The Ministry of Forests and Range were asked to address the question of Range Use Costs in <http://www.boundaryalliance.org/rangecattleproblem.pdf> The Ministry responded by indicating that their guiding legislation required they provide range tenures. In other words MOFR has no intention of assessing the true cost of B.C. Range use.

It is time for someone in Government to do so.

Al Grant writer/researcher for Boundary Environmental Alliance