

Drinking water quality attributes in piped and cistern water in First Nation communities in Manitoba

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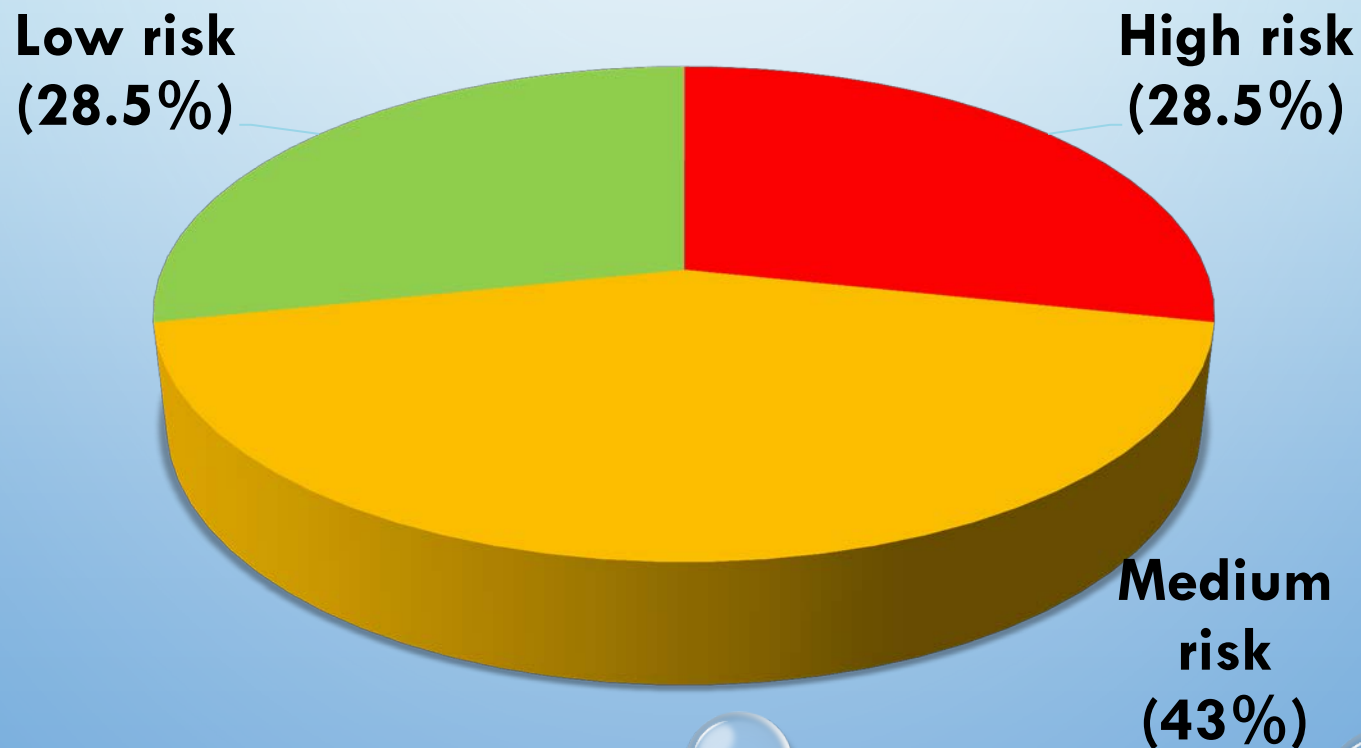
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²SAPOTAWEYAK CREE FIRST NATION COMMUNITY

³PINE CREEK FIRST NATION COMMUNITY

BACKGROUND

First Nations drinking water risk assessment in MB



Water distribution methods in homes (n=15,661)

- **51% piped directly from water plant (7,930)**
- **31% truck delivery and cistern storage (4,777)**
- **13% individual wells (2,078)**
- **5% no water service (876)**



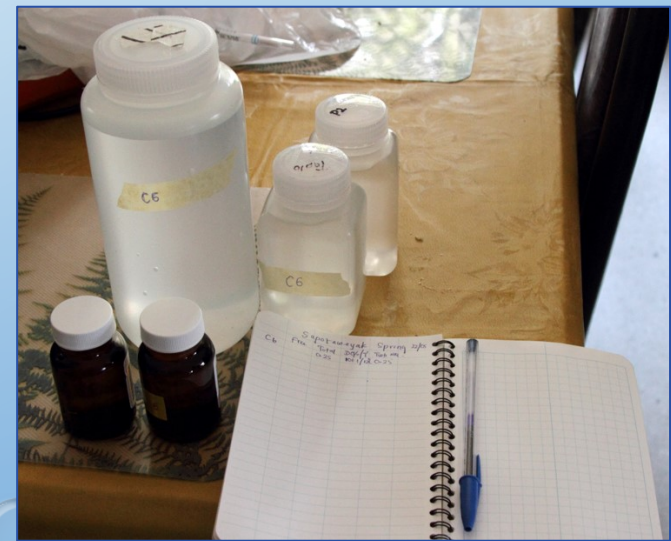
OBJECTIVES

- To compare microbial and chemical quality parameters of drinking water in homes receiving direct piped water vs. those homes that rely on cisterns
- To study the temporal variation of microbial growth in piped and cistern water.

DATA COLLECTION (1 OF 3)

1. A drinking water quality study in **three First Nation communities**, with repeated sampling times

- Pine Creek FN
 - Sapotaweyak Cree Nation FN
 - Garden Hill FN
-
- Free and total residual chlorine
 - Turbidity



Sample analysis

- ***E. Coli*/ total coliform – indicators of fecal contamination**



- **Chlorination by-products (trihalomethanes)**
Modified EPA 551 method GC/ECD

DATA COLLECTION (2 OF 3)

2. Monthly data on *Escherichia coli* (*E. coli*) and total coliform detections in drinking water of three first nation communities

All Bacteriological Results Report ~January 2014 To December 2014

West Region Tribal Council

First Nation :

Community :

Water System : ~~_____~~

Year	Month	Total Number of Samples	E. coli / Fecal Coliform		Total Coliform		Consecutive Unsatisfactory Result From Same Site?	Meets Health Canada Guidelines?
			Number of Unsatisfactory Samples	Percentage of Unsatisfactory Samples (%)	Number of Unsatisfactory Samples	Percentage of Unsatisfactory Samples (%)		
2014	January	13	0	0.0	2	15.4	No	No
	February	20	0	0.0	1	5.0	Yes	No
	March	48	0	0.0	2	4.2	No	Yes
	April	28	2	7.1	6	21.4	No	No
	May	54	1	1.9	7	13.0	Yes	No
	June	43	2	4.7	12	27.9	Yes	No
	July	51	8	15.7	19	37.3	Yes	No
	August	26	1	3.8	11	42.3	Yes	No
	September	24	5	20.8	12	50.0	Yes	No
	October	23	0	0.0	13	56.5	Yes	No
	November	21	0	0.0	7	33.3	Yes	No
	December	0						
Totals:		351	19	5.4	92	26.2	8 of 11 = Y	1 of 11 = Y

DATA COLLECTION (3 OF 3)

3. % samples in 2014 with positive detection of total coliform in drinking water based on data collected in **all first nation communities across MB**

Winnipeg Free Press

≡ ALL SECTIONS LOCAL ARTS & LIFE BUSINESS SPORTS TRAVEL OPINION HOMES AUTOS CLASSIFIED

🏠 > Local

Local

Unsafe water in reserve storage tanks

Nearly one-third of tests fail in First Nations



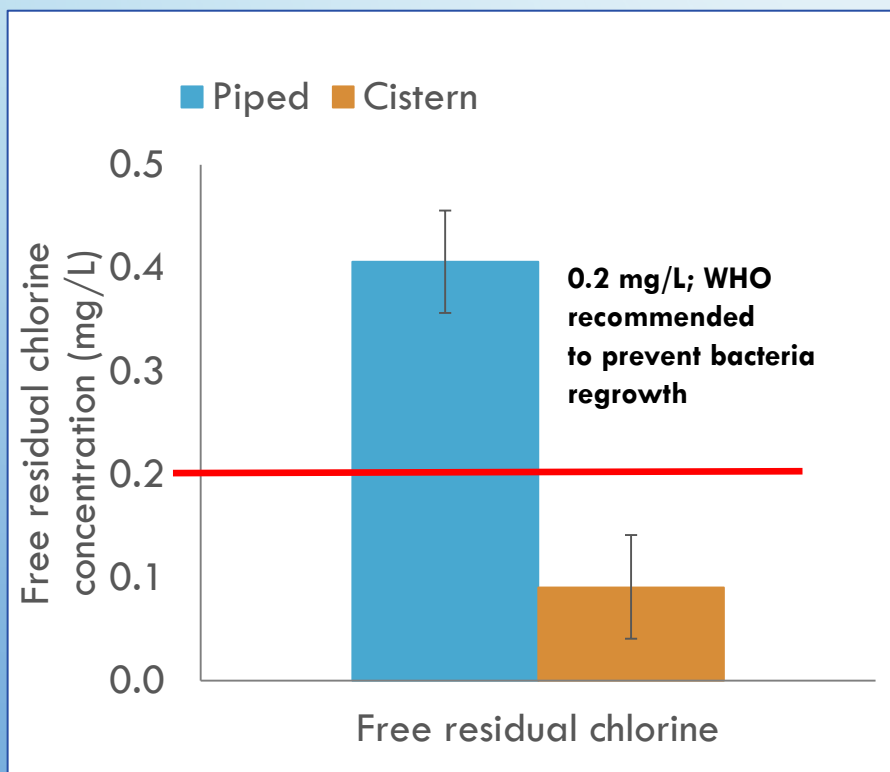
By: Mary Agnes Welch

Posted: 11/20/2015 3:00 AM | Last Modified: 11/20/2015 9:14 AM | [Updates](#) | [Comments: 65](#)

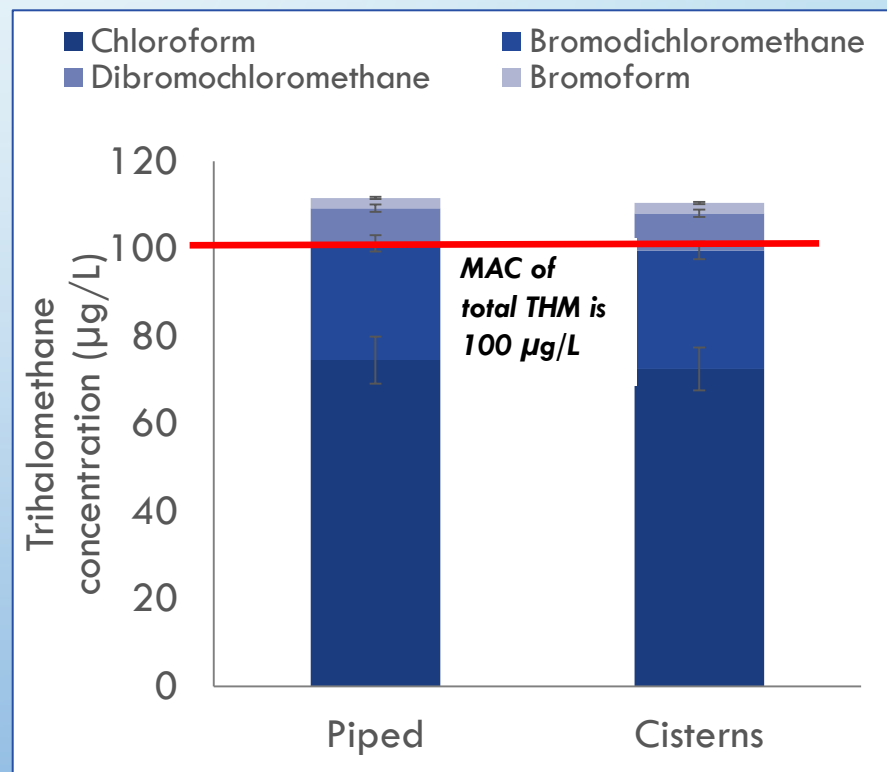
Percentages of total coliform detection in water distribution systems

Community	Sample date	Distribution system	No of samples	% Positive
Pine Creek FN	1 (Mar 2015)	Piped	8	50
		Cistern	10	90
	2 (May 2015)	Piped	7	57
		Cistern	9	78
	3 (Oct 2015)	Piped	8	12
		Cistern	7	43
Sapotaweyak FN	1 (Oct 2015)	Piped	10	0
		Cistern	8	75
	2 (Feb 2015)	Piped	10	0
		Cistern	8	25
	3 (Oct 2015)	Piped	8	0
		Cistern	8	0
Garden Hill FN	1 (June 2015)	Piped	10	30
		Cisterns	8	62

Free residual chlorine concentration in drinking water (n=119) in three First Nations communities across seven sampling dates

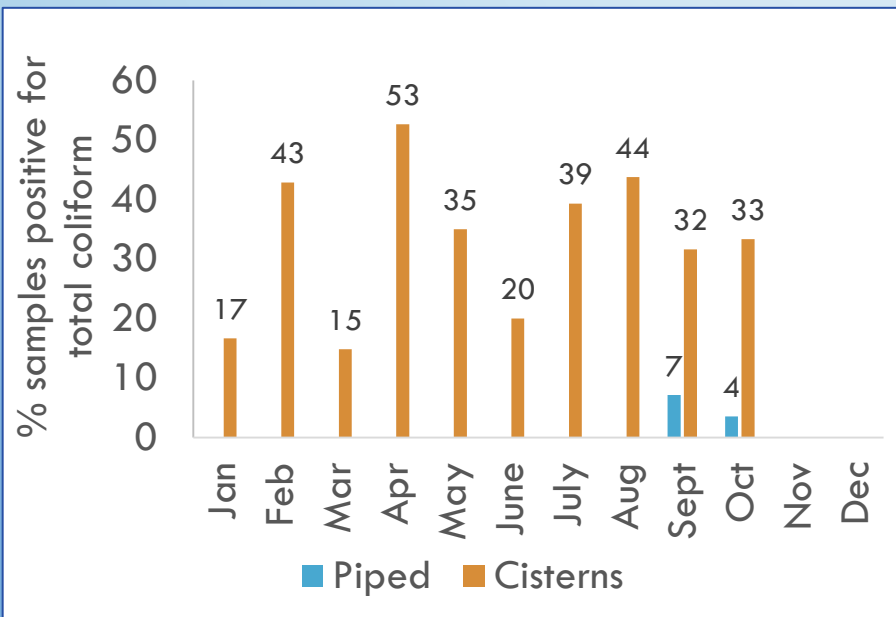


Trihalomethanes (THM) in drinking water (n=119) in three First Nations communities across seven sampling dates

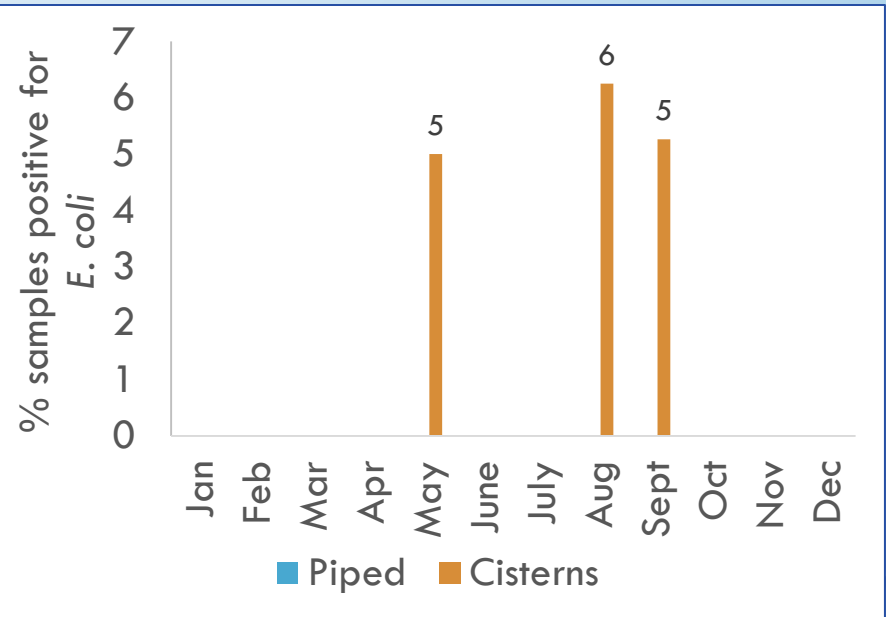


Garden Hill FN – 2014 (n=577)

Frequency of the detection of total coliforms in drinking water samples

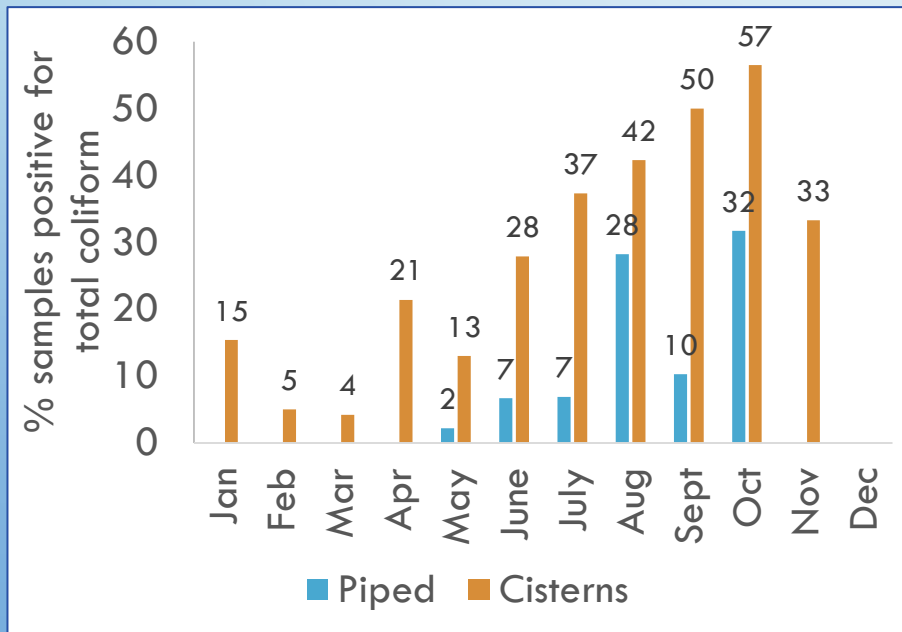


Frequency of the detection of *E. coli* in drinking water samples

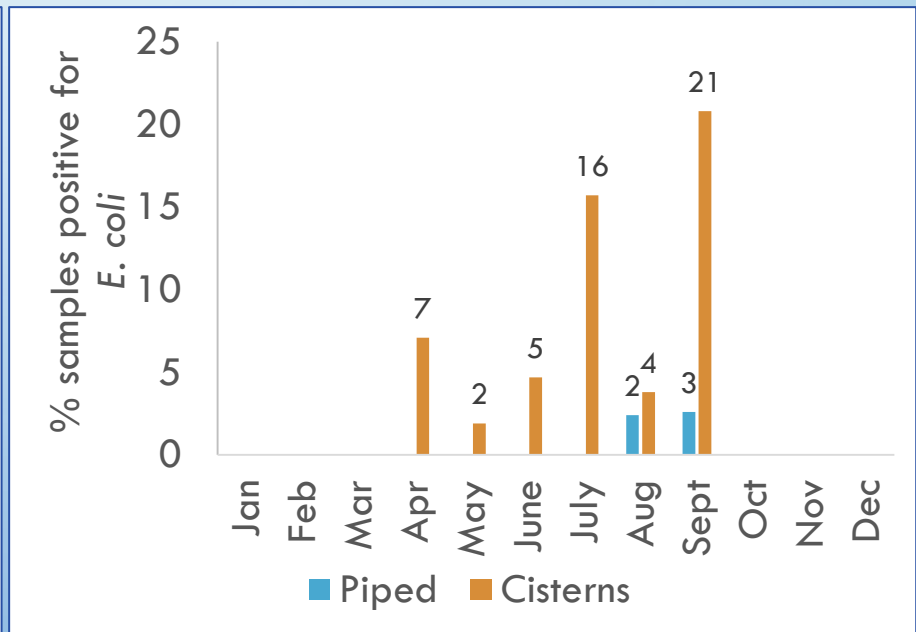


Pine Creek FN – 2014 (n = 722)

Frequency of the detection of total coliforms in drinking water samples



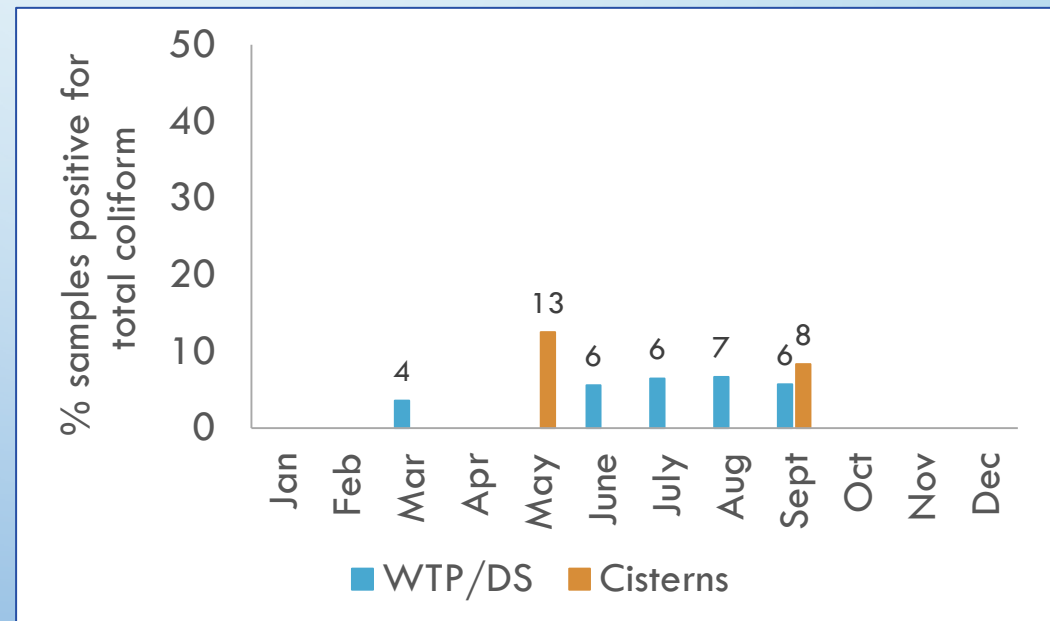
Frequency of the detection of E. coli in drinking water samples



Frequency of the detection of total coliforms in drinking water samples Sapotaweyak Cree Nation



2015 (n=381)



WTP/DS - water samples from water treatment plant or piped distribution system

SAPOTAWEYAK CREE FN

History of water cisterns

TABLE 2 - SATISFACTORY VS UNSATISFACTORY
BACTERIOLOGICAL WATER RESULTS BY WATER SOURCE
FIRST NATIONS DRINKING WATER SAFETY PROGRAM

COLILERT (QUANTI-TRAY) AND ETL MONTHLY RESULTS
APRIL 1, 2002³ MARCH 31, 2003⁴
(monthly and quarterly reporting)

MONTH	WTP/DS-S	WTP/DS-US	WDT-S	WDT-US	WELLS-S	WELLS-US	C/B-S	C/B-US	OTHER-S	OTHER-US	TOTAL-S	TOTAL-US	
April	48	0	-	-	-	-	25	4	-	-	73	4	(77)
May	28	1	-	-	-	-	25	4	-	-	53	5	(58)
June	22	1	-	-	-	-	17	19			39	20	(59)
July	28	1	1	0	-	-	9	38			38	39	(77)
August	20	1	-	-	-	-	8	35			28	36	(64)
September	33	3	-	-	-	-	9	15			42	18	(60)
October	29	1	-	-	-	-	18	22			47	23	(70)
November	30	0	-	-	-	-	8	16			38	16	(54)
December	19	1	-	-	-	-	9	10			28	11	(39)
January	42	1	-	-	-	-	15	8			57	9	(66)
February	62	1	-	-	-	-	3	2			65	3	(68)
March	42	2	-	-	0	3	-	-			42	5	(47)
TOTALS	403	13	1	-	-	3	146	173			550	189	(739)

WTP: WATER TREATMENT PLANT
(Raw & Treated: sampling recommended every 2-weeks)

DS: DISTRIBUTION SYSTEM
(Monthly sampling recommended: 4-sites)

WDT: WATER TRUCK DELIVERY
(Monthly sampling recommended)

WELLS: PRIVATE WELLS
(Yearly sampling recommended)

C/B: CISTERN/BARREL (water holding tanks)
(Twice per year sampling recommended)

S: SATISFACTORY BACTI RESULT (TOTAL COLIFORM: <10 / FECAL COLIFORM: 0)
US: UNSATISFACTORY BACTI RESULT (TOTAL COLIFORM: >10 / FECAL COLIFORM: 1 OR MORE)

Community: Sapotaweyak Cree Nation

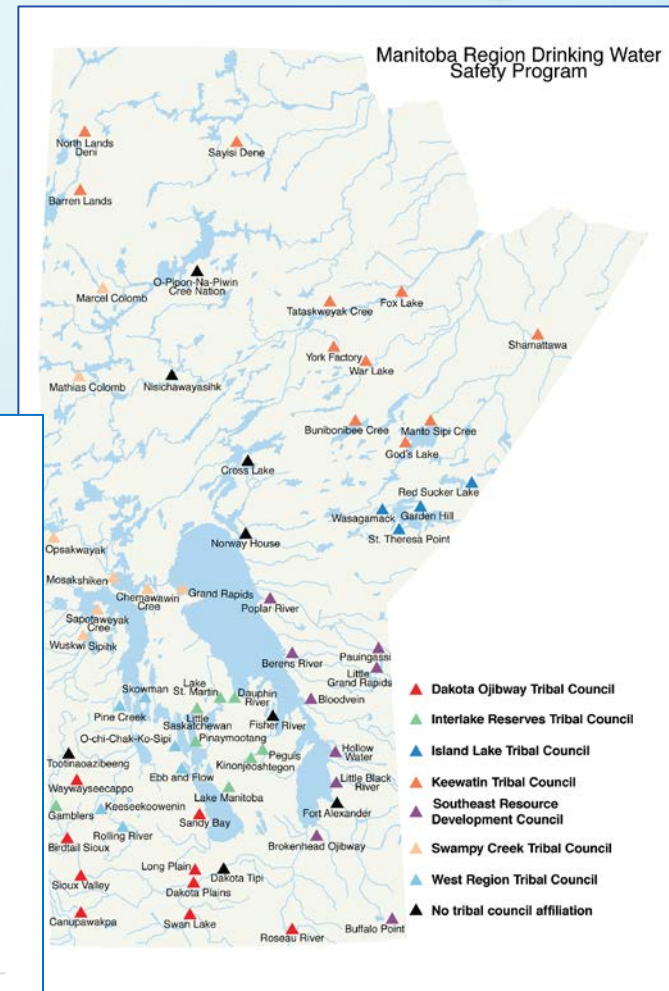
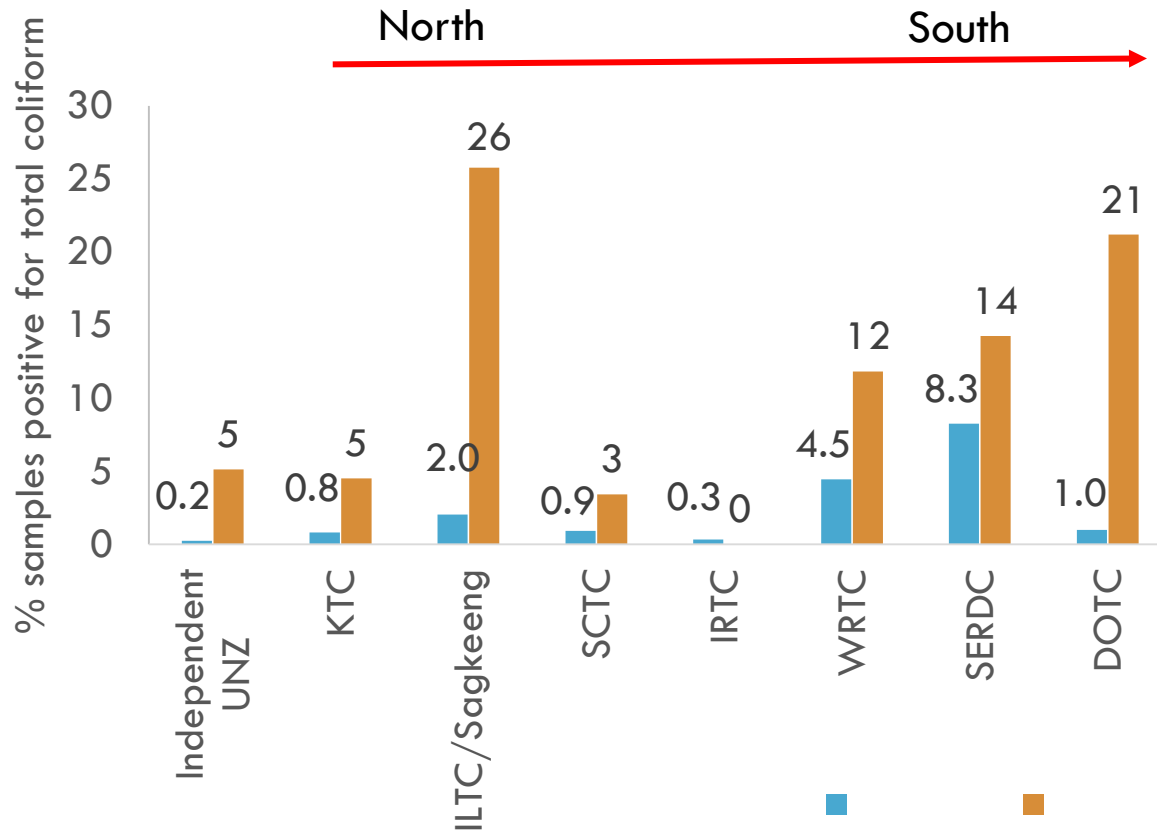
Worker: Frank Coole
(Please sign)

Dated: April 13/04

Fax to EHO and provide copy to
local Health Director: June 30,
Sept. 30, Dec. 31 and March 31.
(quarterly reporting)

Prepared by Environmental Health Services, FNIHB, Health Canada (MB Region): 2002

% Water samples containing bacteria in 2014 in all First Nation communities in MB (n=27,022)



WTP/DS - water samples from water treatment plant or piped distribution system

CONCLUSIONS

- Free chlorine concentration was lower in cistern water samples than in piped water samples in all three communities.
- Higher *E. coli* and total coliform populations were also observed in cistern water than in piped water.
- THM concentration was not affected by the distribution system but was above the Health Canada recommended.
- Monthly Health Canada data showed that *E. coli* and total coliform detection varied monthly.
- Annual Health Canada data for all First Nation communities in MB showed that % frequency of detection of total coliform was higher in cistern than piped water and higher in southern communities than northern communities

ACKNOWLEDGEMENT

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- [CREATE H2O](#) PROGRAM, WENDY ROSS, PROGRAM COORDINATOR AND HELEN FALLDING, MANAGER, CENTRE FOR HUMAN RIGHTS RESEARCH
- NSERC POSTGRADUATE SCHOLARSHIPS - DOCTORAL (PGS D)

The background is a light blue gradient, darker at the bottom. It is decorated with several realistic water droplets of various sizes, some with highlights and shadows, scattered around the edges.

THANK YOU