



Microbial Contamination Studies Around Sewage Lagoons

**SEWAGE LAGOON
DISCHARGE AREA
BIOLOGICAL
HEALTH HAZARD
DANGER KEEP OUT**

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- **Assessment of Contaminant Concentrations and Transport Pathways in Rural Alaskan Wastewater Sites**
- **Environmental Regulatory Enhancement:
Building capacity to regulate and monitor sewage discharge in the Yukon River Watershed**



Yukon River Inter-Tribal Watershed Council



- 70 First Nations and Alaskan Tribes are members, with offices and technical staff in Anchorage, Fairbanks and Whitehorse.
- The Council's Mission is to protect and improve water quality in the Yukon River, to achieve a 50-year vision of a Yukon River clean enough from which to drink.



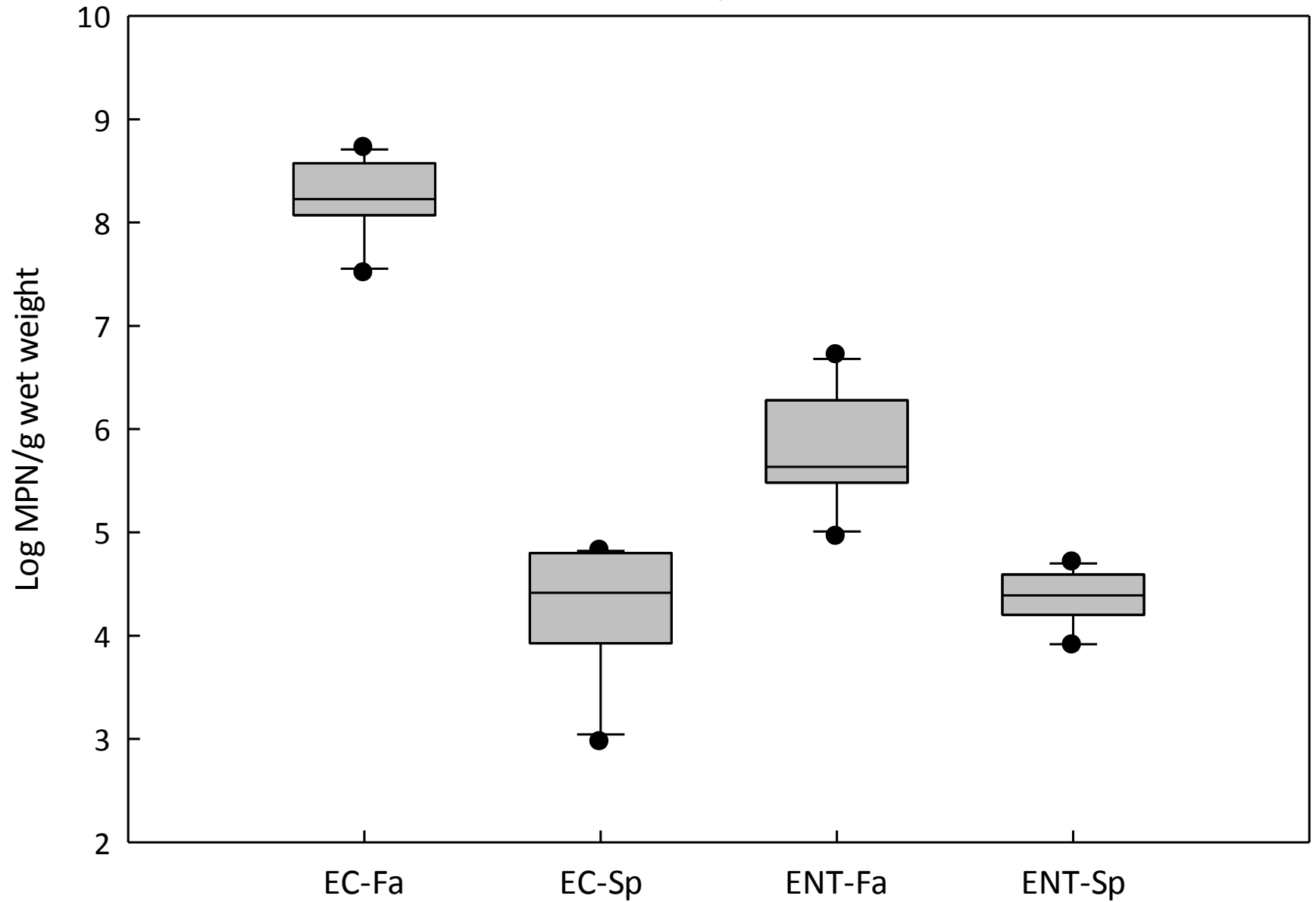
Microbial Indicator Organisms



- Used because it's difficult, time-consuming, and expensive to test directly.
- “Indicators” of other disease-causing (i.e., pathogenic) microbial organisms.
- Detect possible sewage contamination
- *E. coli* and *Enterococci* are the EPA recommended indicators for recreational waters



Survivability of MIO



MIO survivability in manure before and after stored in -40 degree Celsius for six months.

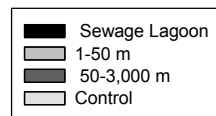
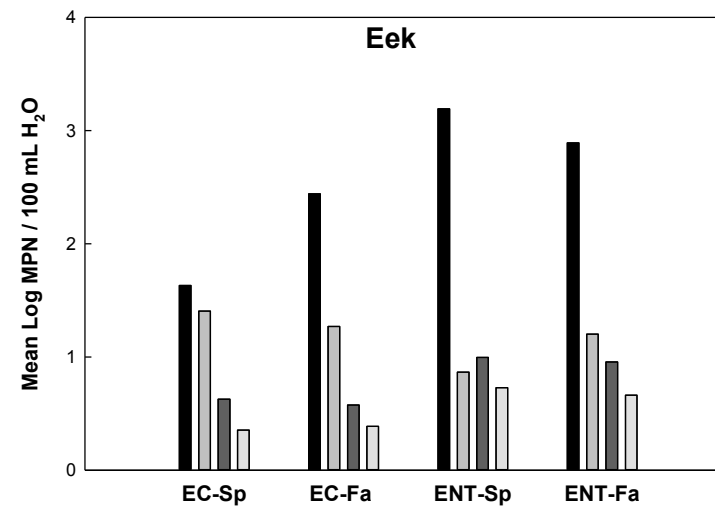
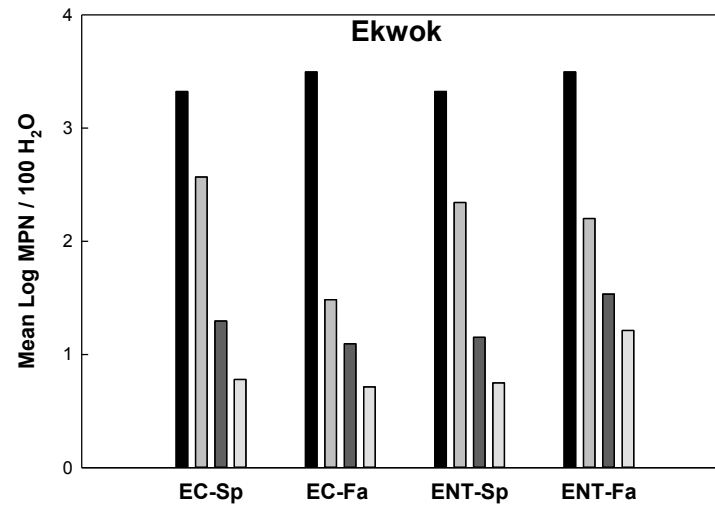
Constructed Lysimeters ,2008



Pearson Correlation for Waters

	MPN ENT	pH	Temperature	Conductivity	TSS
MPN EC	0.844	0.0548	0.007	0.004	0.505
	3.5E-055	0.442	0.917	0.956	2.9E-014
	199	199	199	199	199
MPN ENT		0.0564	0.0830	0.004	0.508
		0.429	0.244	0.961	1.9E-014
		199	199	199	199
pH			0.282	0.356	0.085
			5.1E-06	2.5E-08	0.232
			199	199	199
Temperature				0.260	0.214
				2.1E-05	0.003
				199	199
Conductivity					0.370
					7.5E-09
					199

*For pairs with P values greater than 0.050, there is no significant relationship between the two variables.



Lab Ecoli MPN/100ml

100

90

80

70

60

50

40

30

20

10

0

Eagle

Fort Yukon

Venetie

Nenana

Tanana

Ruby

Allakaket

Anvik

Marshall

St. Mary's

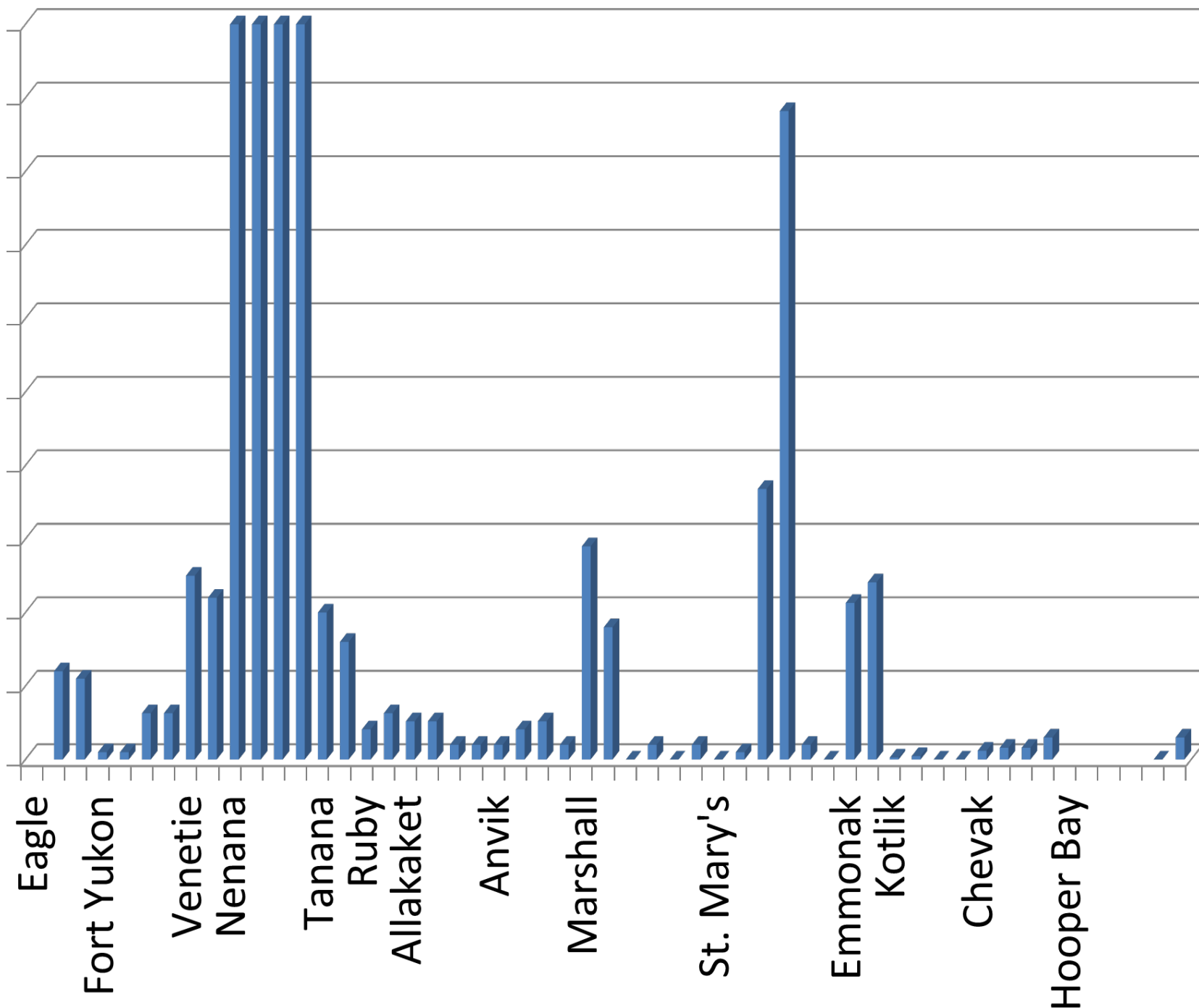
Emmonak

Kotlik

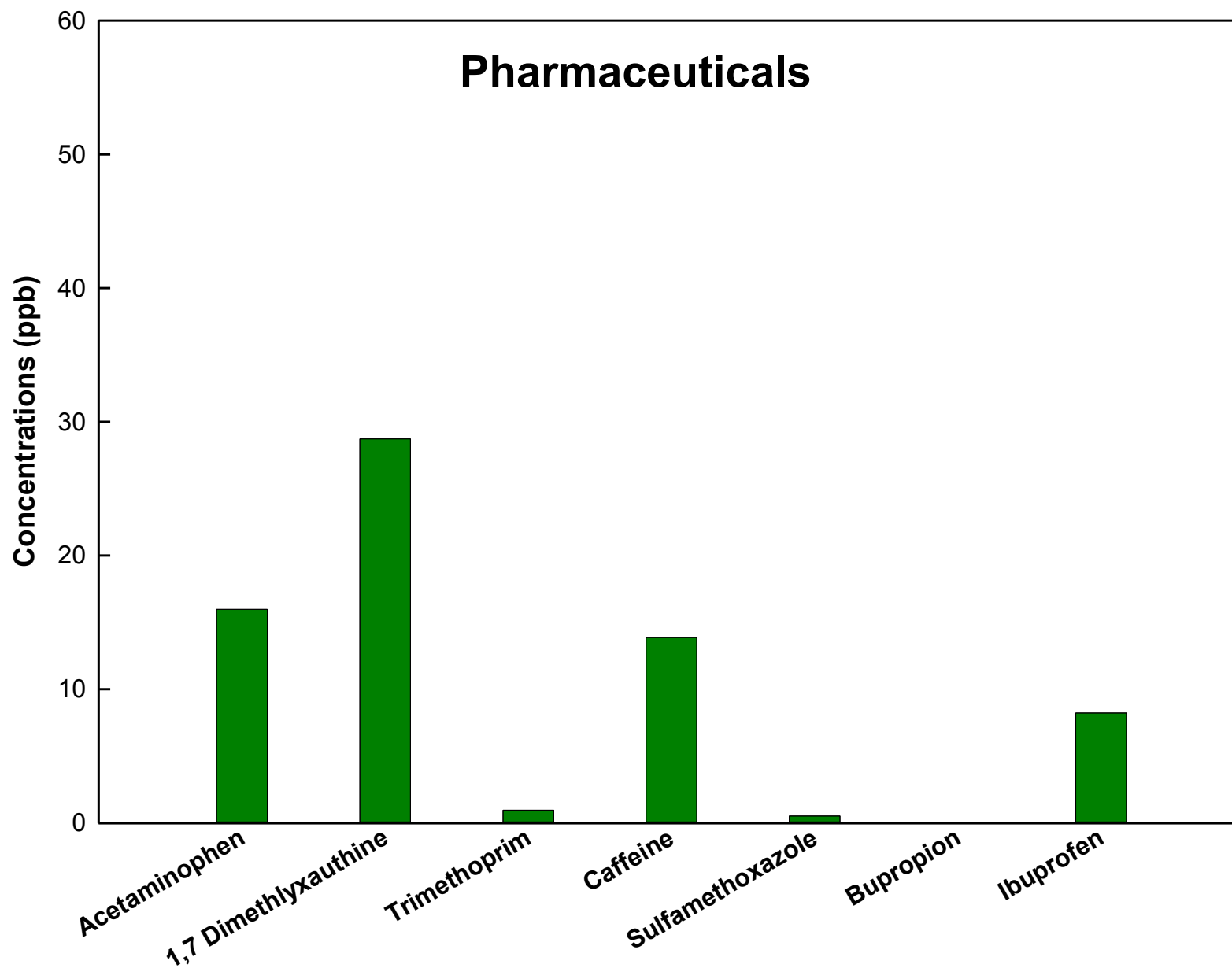
Chevak

Hooper Bay

N= 120



Pharmaceuticals



Conclusions

- **The microbial indicator organisms' density were detected in the range of 1.1- >3.4 Mean Log MPN/100mL.**
 - Although the 2011 Alaska Water Quality Standards sets limits upon Fecal Coliform bacteria rather than the indicator organisms tested, it is unlikely that these waters would meet the microbial water quality standard for any designated use.
- **The lysimeter partitioning behavior study results demonstrating that MIO in snowmelt tend to preferentially associate with particulates in surface flows**
 - The lysimeter study also showed that *ENT* survived cold storage in the field and laboratory in greater numbers than did *EC* bacteria, thus indicating that ENT may serve as a more robust indicator organism in Alaskan environmental conditions.
- **No significant microbial indicator organisms' density were detected in Yukon River samples.**
- **In rural Alaska leachate and raw sewage pharmaceuticals (sulfamethoxazole and trimethoprim (antibiotics), non-prescription drugs ibuprofen and Tylenol (acetaminophen), bupropion (antidepressant), caffeine and 1,7-dimethylxanthine.**

Thank You!

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