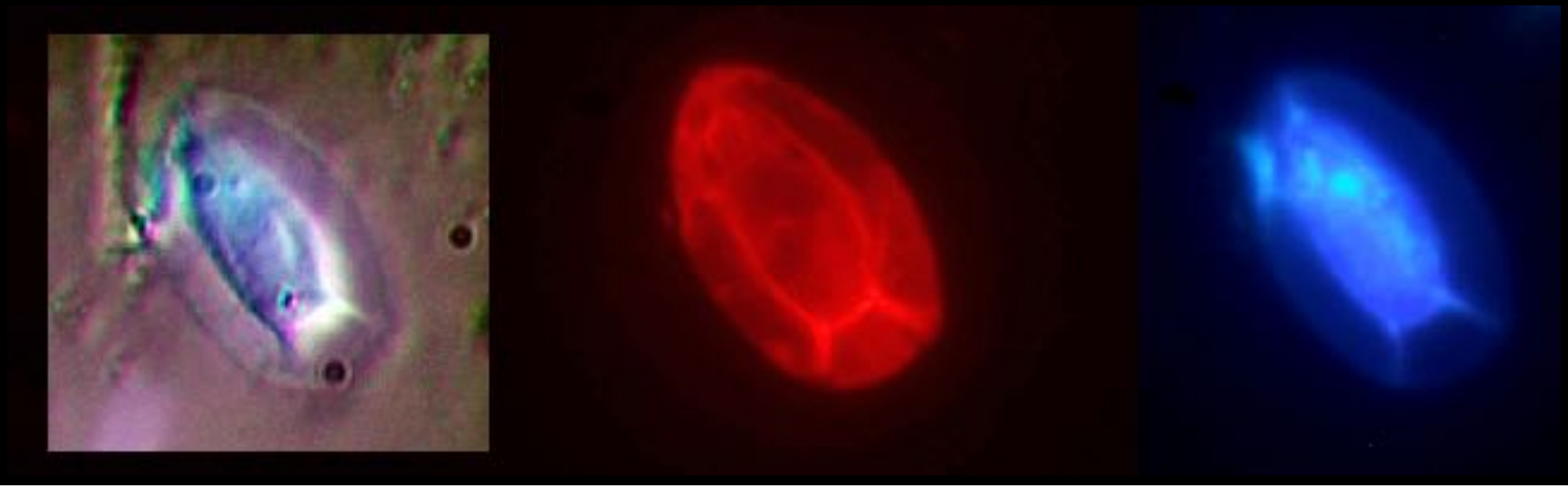
A Simplified Microscopic Particulate Analysis for use in GARP Determination



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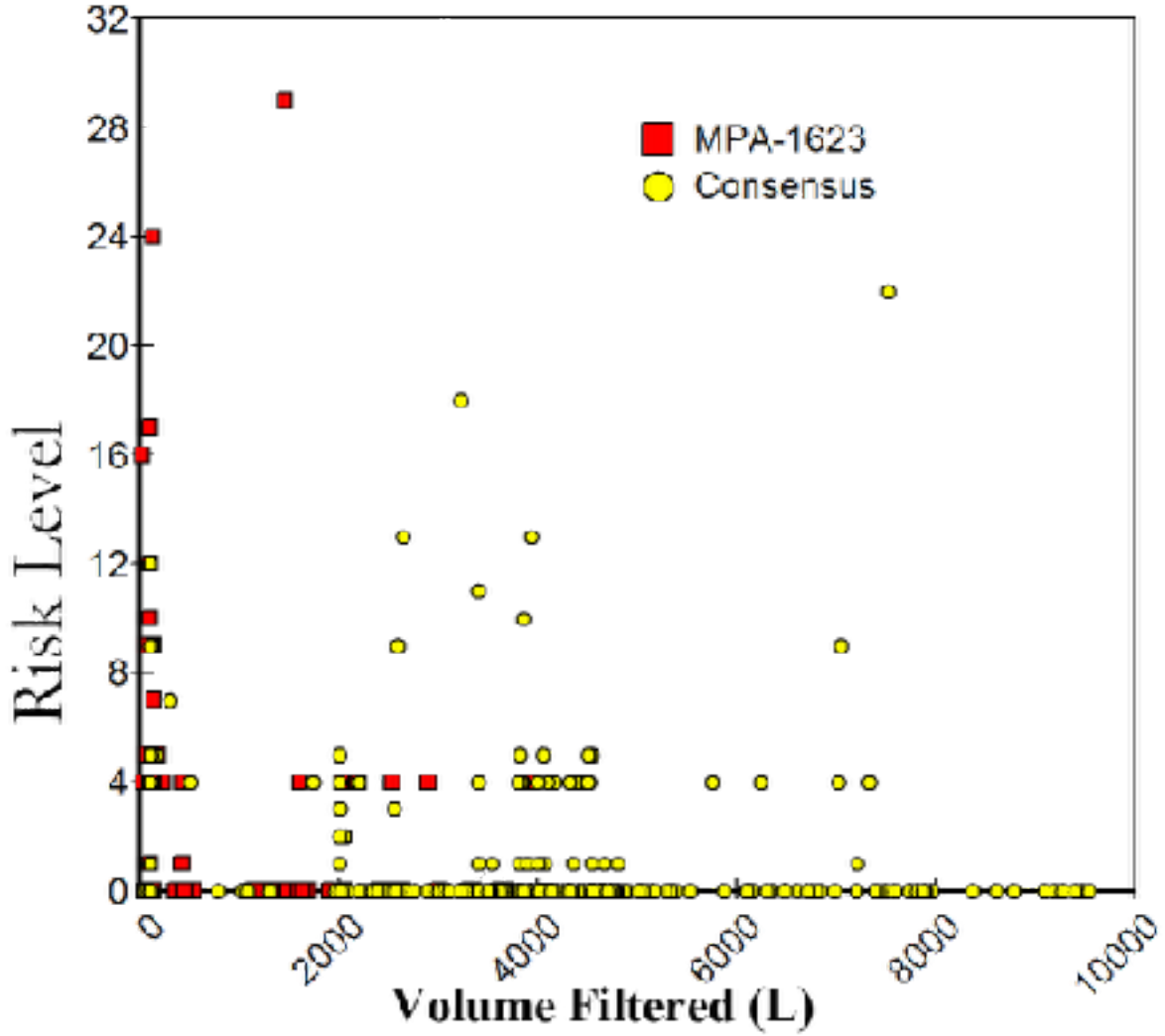
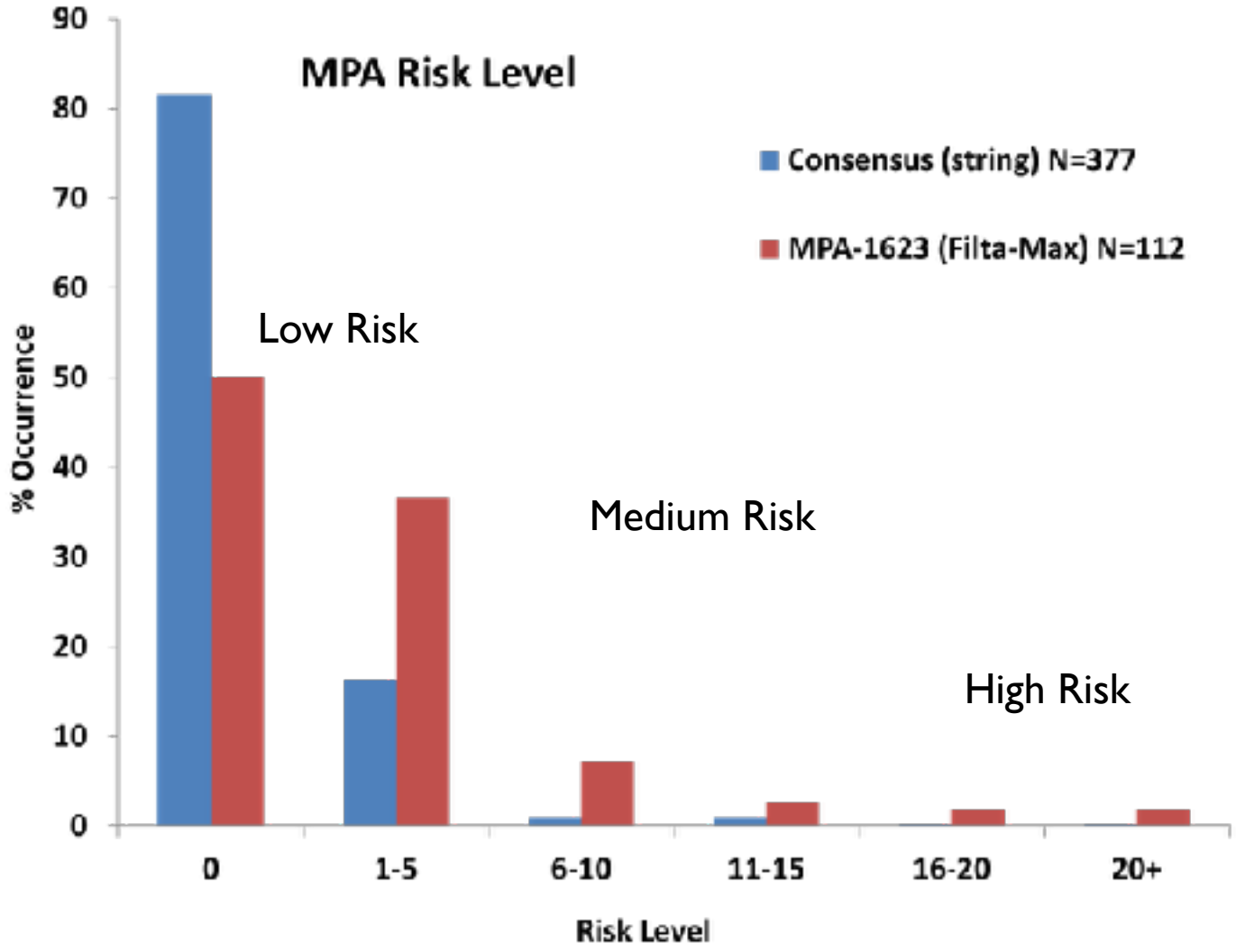
1. Hyperion Research Ltd., 1008 Allowance Ave. SE, Medicine Hat, AB T1A 3G8
2. Ministry of Forests, Lands and Natural Resource Operations, 499 George St., Prince George, BC V2L 1R5
3. Northern Health, 299 Victoria St., Prince George, BC V2L 5B8
4. Catherine Henry Environmental Consulting, 2017 Willowview Dr., Dawson Creek, BC V1G 2S6

BACKGROUND: Filtering More Water Does Not Affect Risk Prediction



MPA-1623: Better Filtration & Elution Technology Saves Field Time and Improves Results



Project Objectives

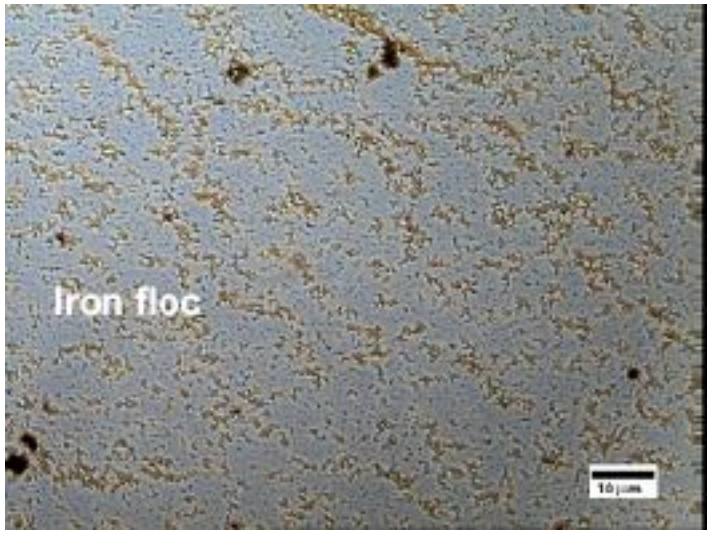
- Test the idea that MPA risk can be estimated from a small, grab sample at Level 2 in a GARP determination
- Evaluate the contribution of turbidity to risk
- Can MPA risk be correlated with geochemical measurements in the field or bacteriology?

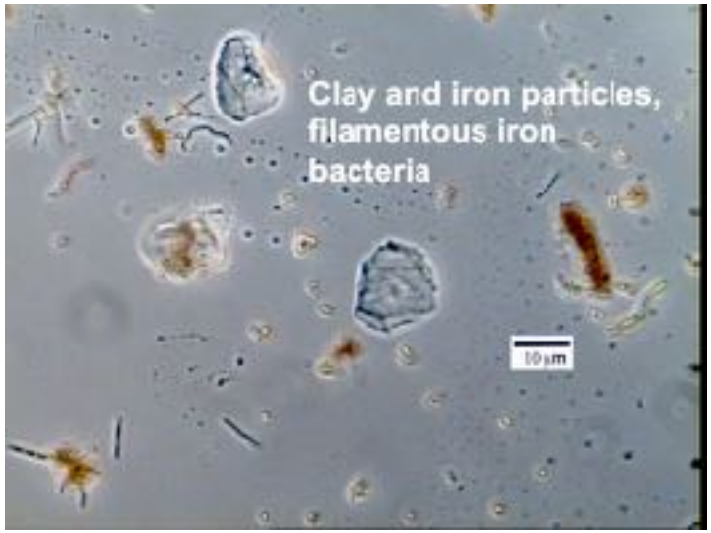
Results from Wells & Springs

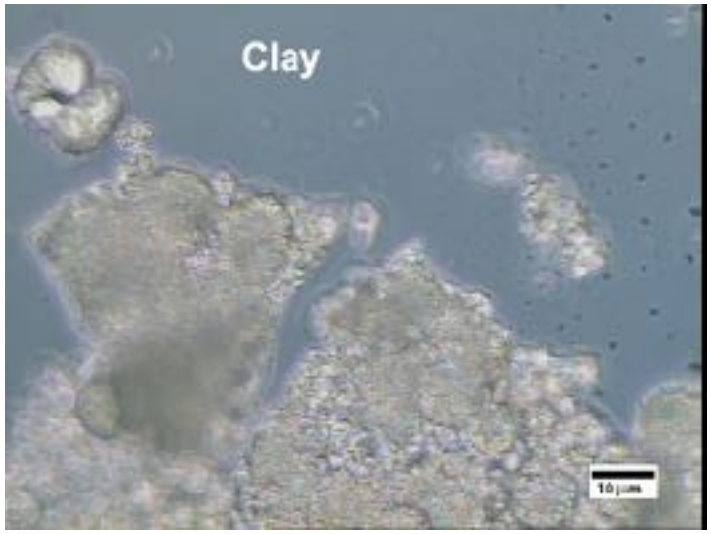
Predicted Risk	Springs		Wells	
	Developed	Undeveloped	Drilled Wells	Dug Wells
Low	5	9	1*	0
Medium	6	4	8	0
High	9	2	66	2

* Hair, probably rodent, was found in this well!

What we See Under the Microscope: - Iron, Silica and Clay Minerals

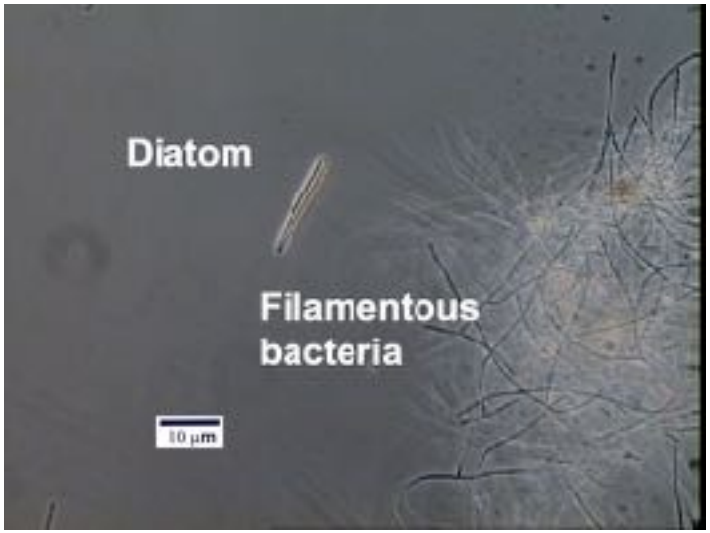


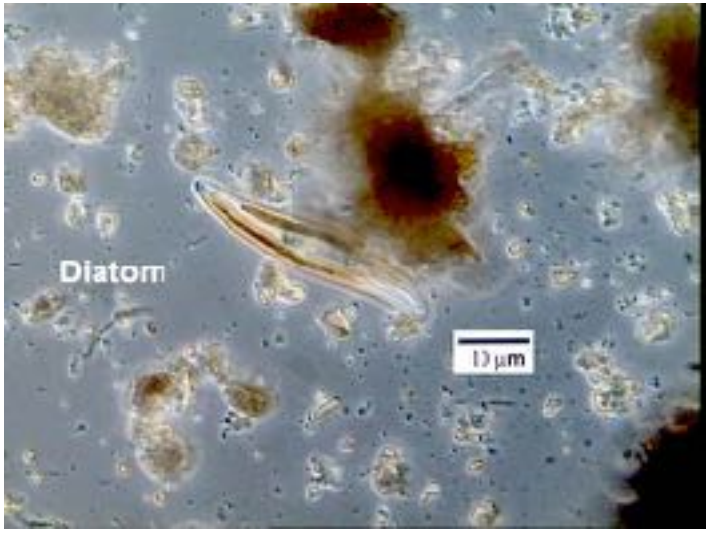


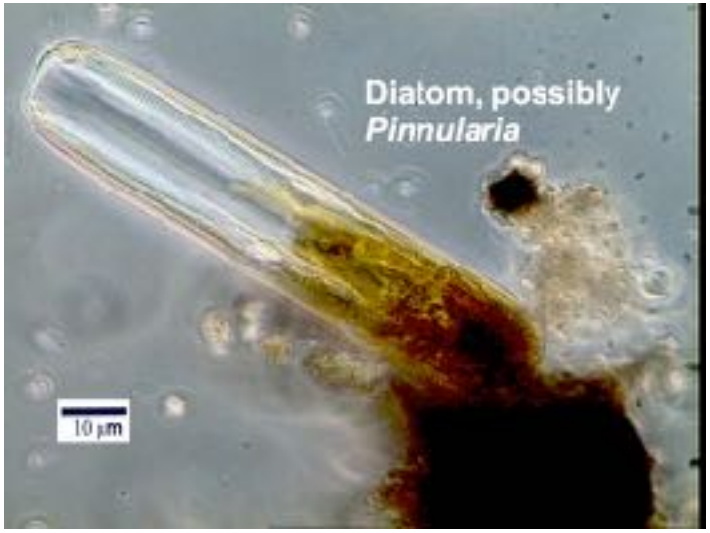


- Diatoms

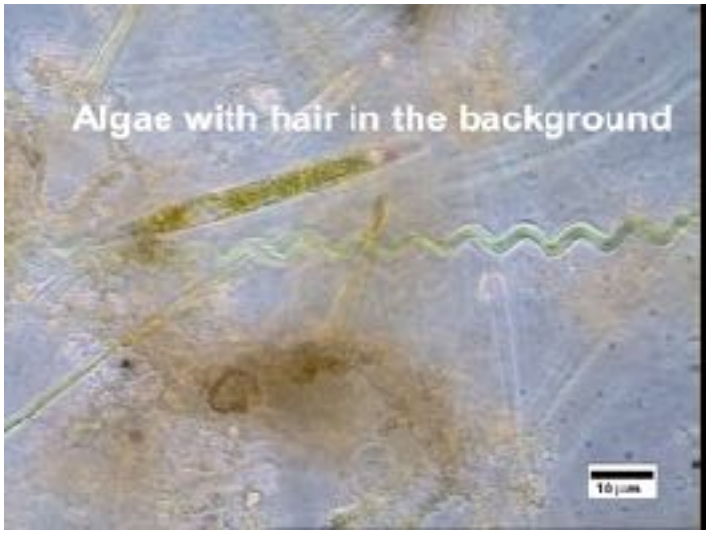
Diatoms
10 µm

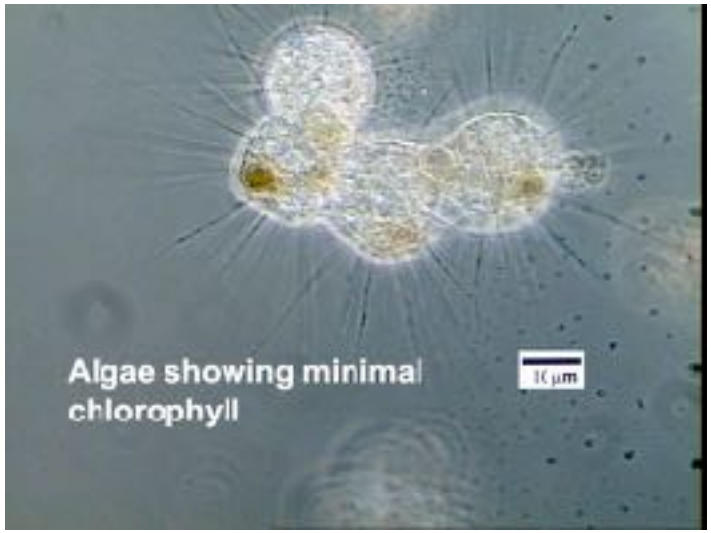

Diatom
Filamentous bacteria
10 µm

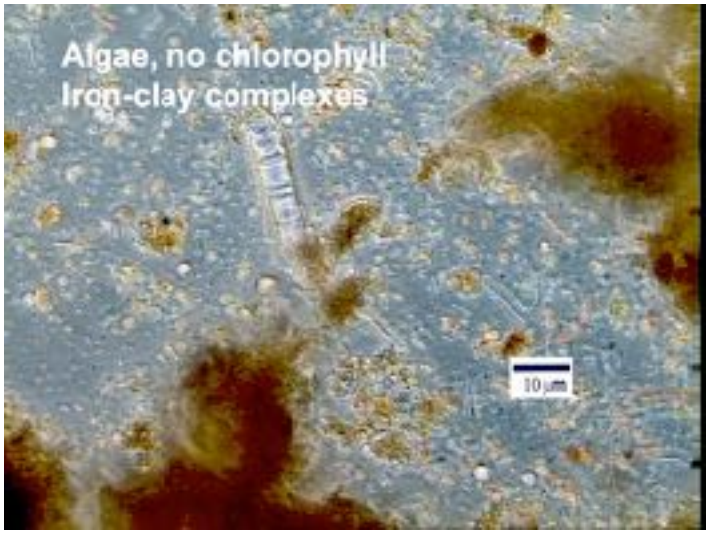

Diatom
10 µm

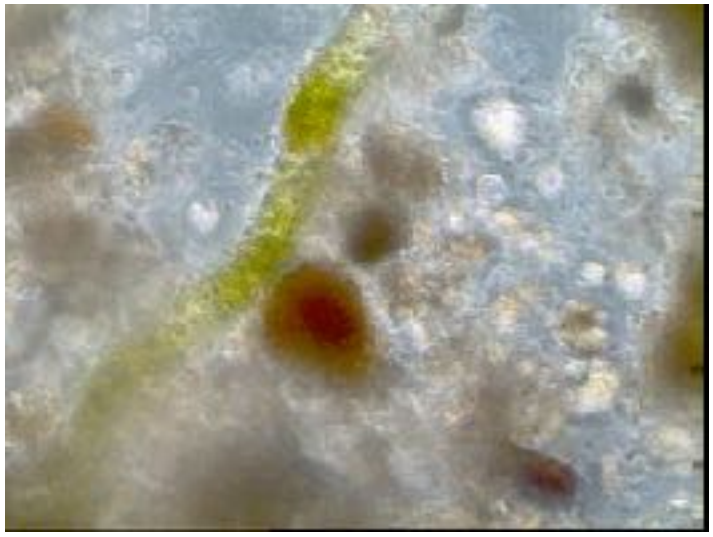

Diatom, possibly *Pinnularia*
10 µm

- Other Algae


Algae with hair in the background

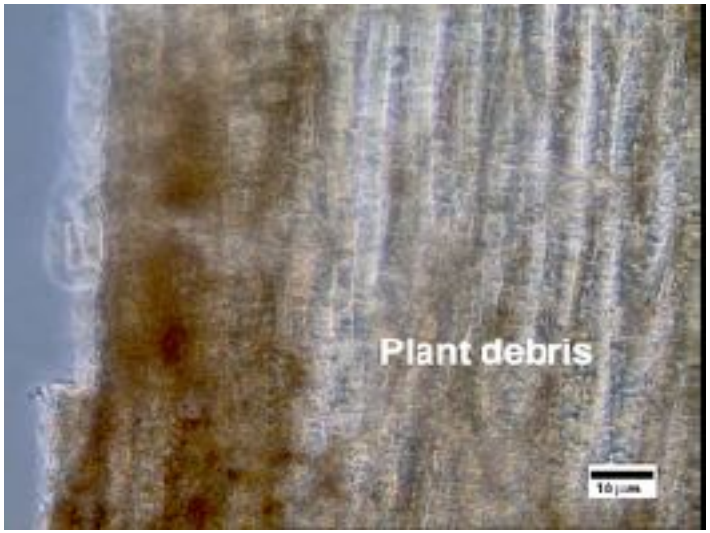

Algae showing minimal chlorophyll

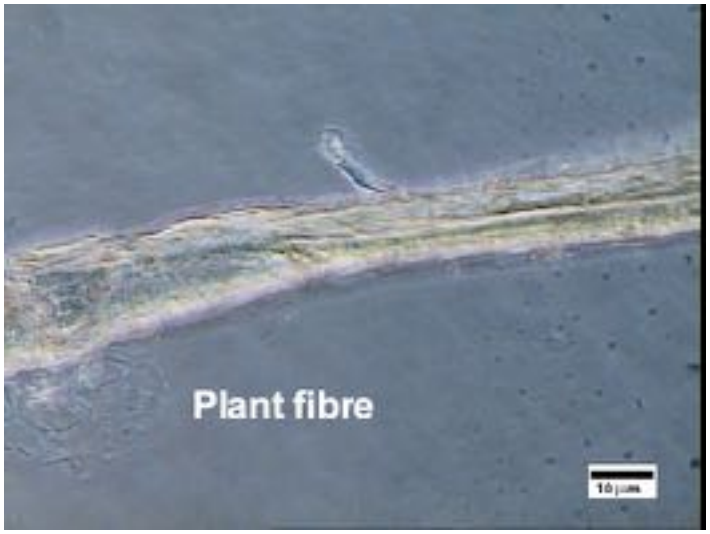

Algae, no chlorophyll
Iron-clay complexes



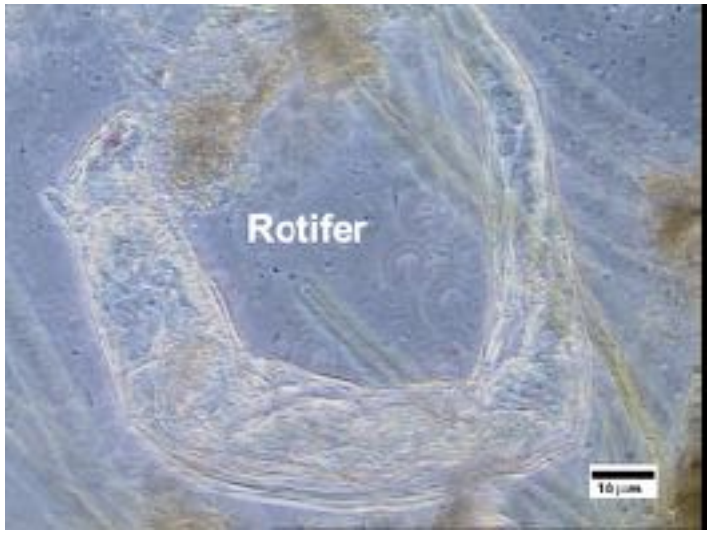
- Other Interesting Objects

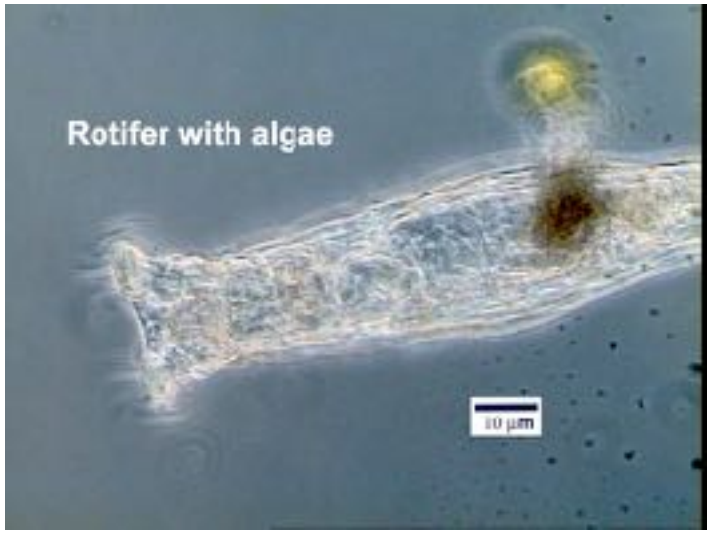
- Plant Debris





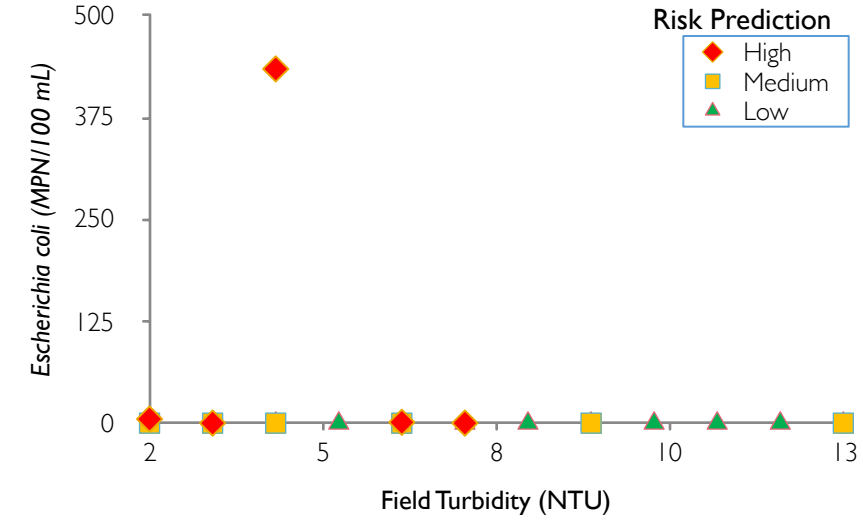
- Rotifers

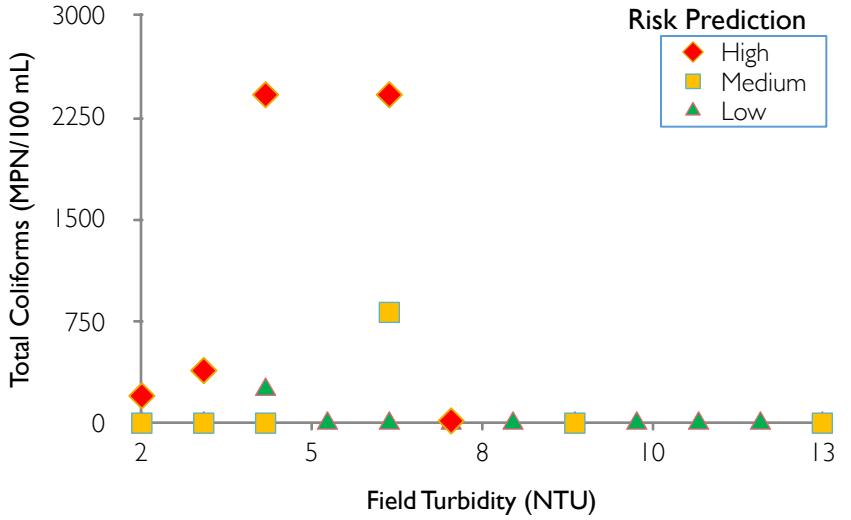


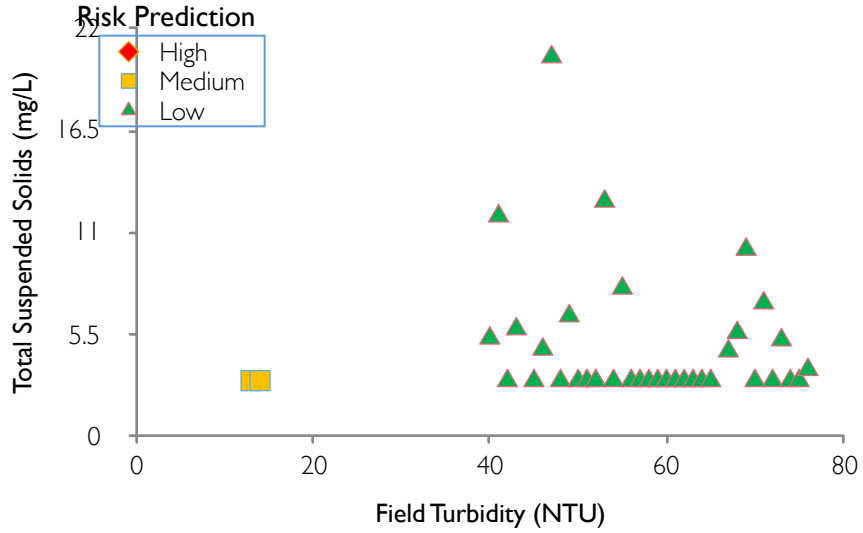


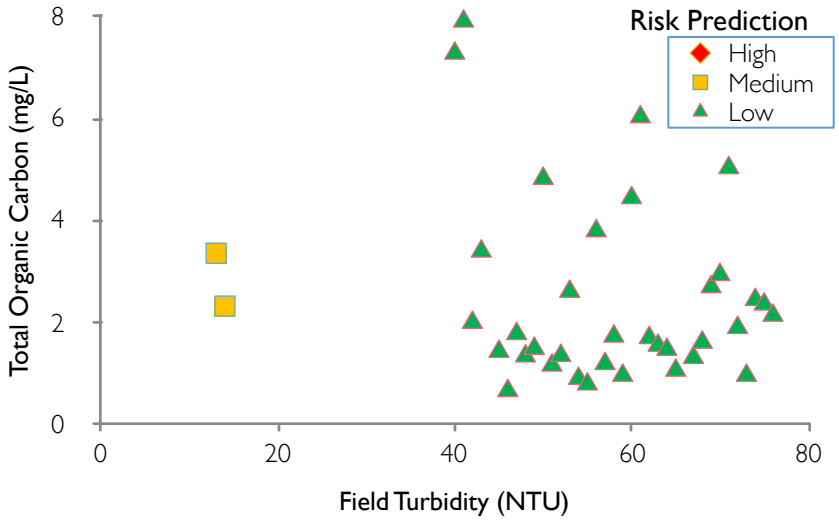
Rotifer https://youtu.be/eVyTJdFifEI

Turbidity is not closely related to Total Coliforms, *E. coli*, TOC or TSS

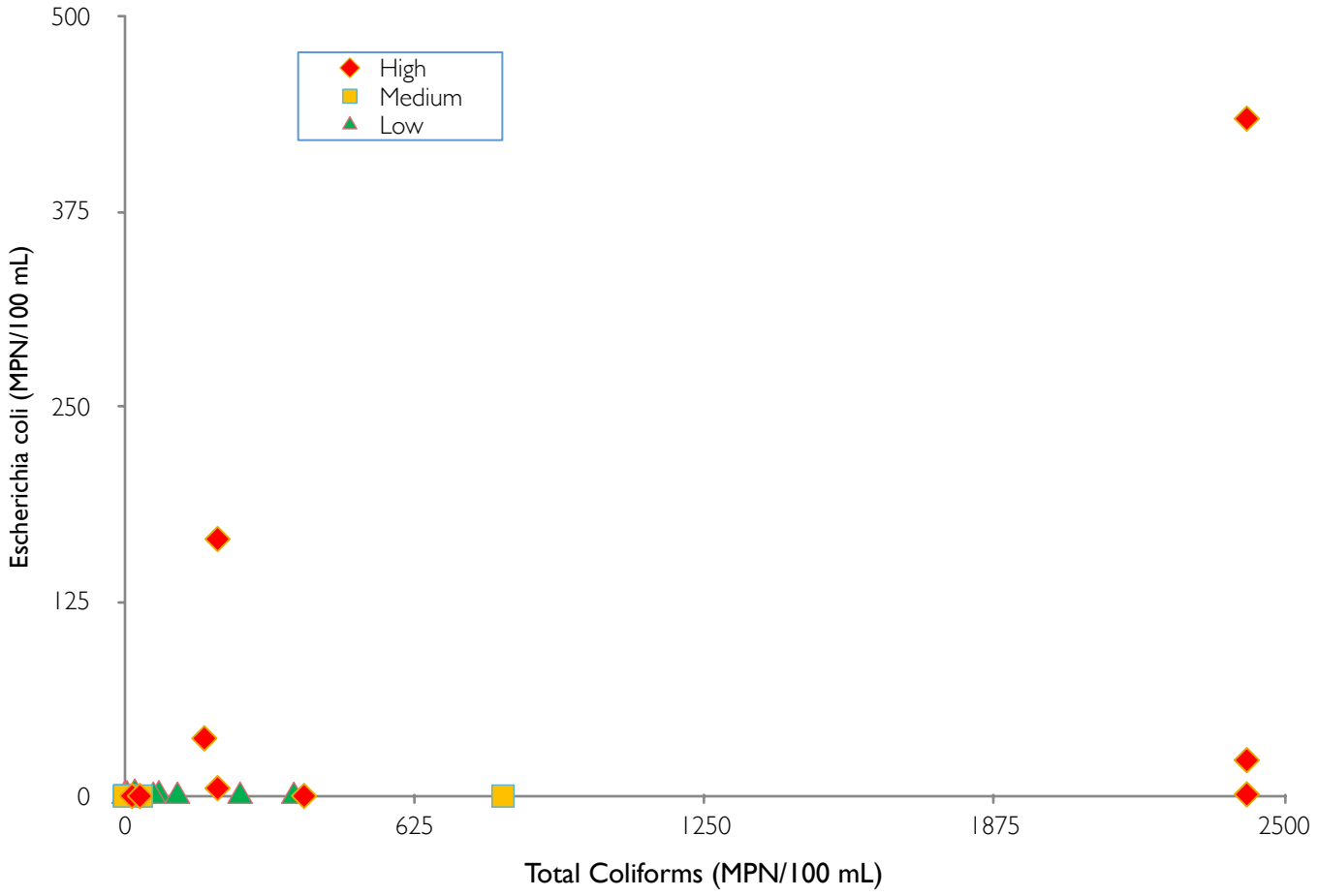




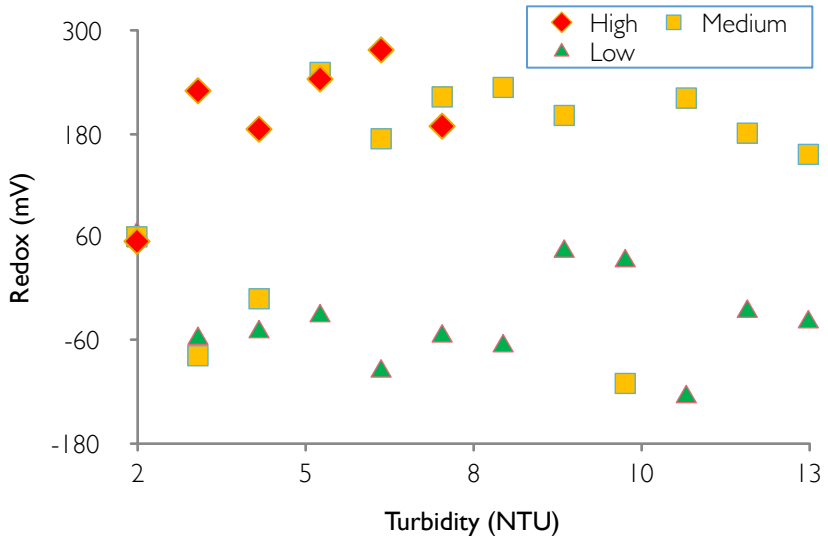




But Any *E. coli* or High Total Coliforms Were Associated with Higher Risk



Turbidity and Redox Potential (ORP) are Associated with Risk



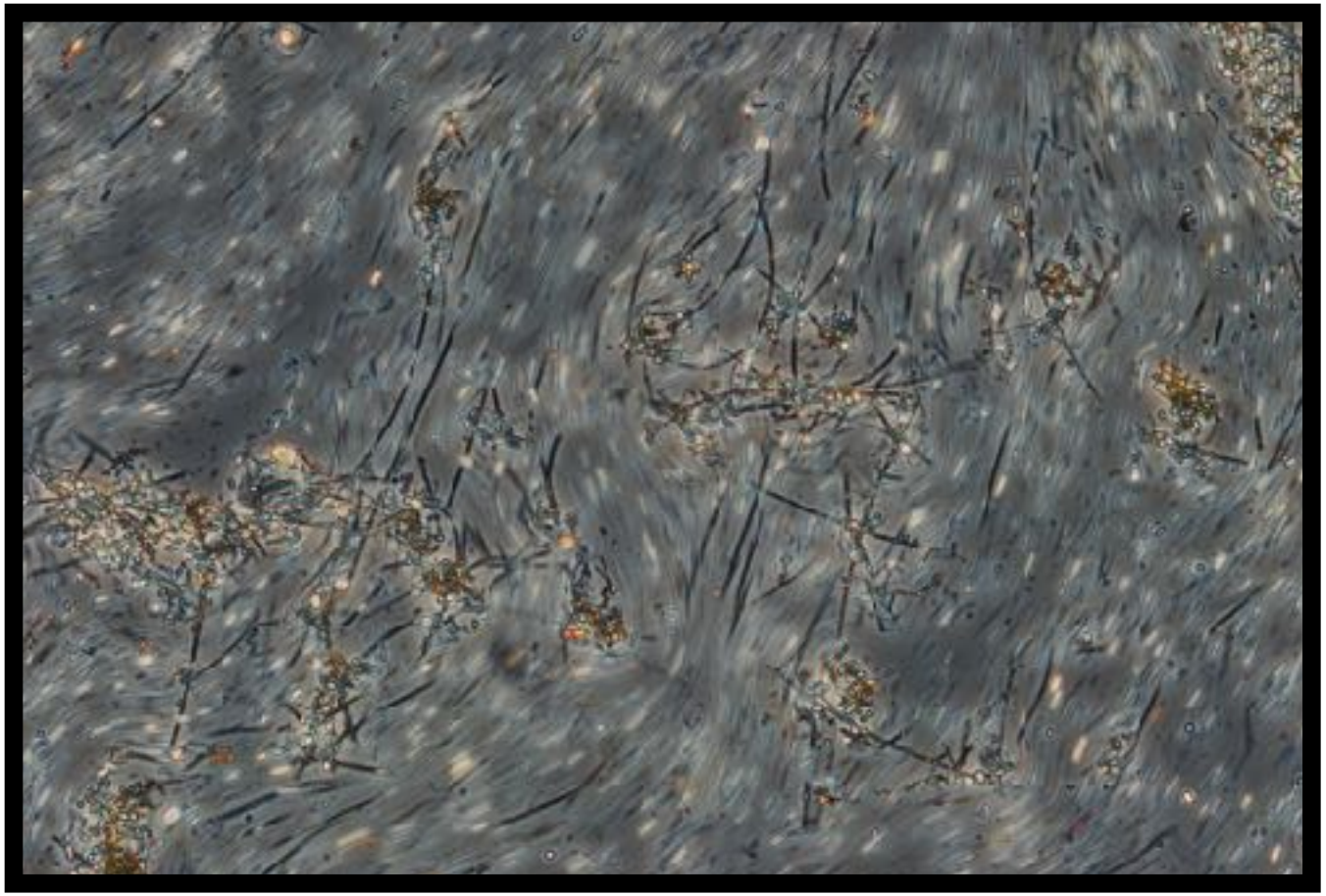
2 variable model: Risk = *f* (Turb, ORP) $\text{Risk} = m_1 \cdot \text{Turb} + m_2 \cdot \text{ORP} + \varepsilon$

	Turb	ORP	
slope (m)	0.022	0.0007	
SE(m)	0.009	0.0006	
t = m / SE		2.41	1.19
p-value	0.009	0.118	
statistical significance	**	ns	
coeff of determination (r^2)			6.6%

Conclusions

- If surface water organisms can be detected in 2L of water, it's GARP
- Filtering large volumes of water does not make an MPA test more sensitive
- Turbidity and TSS alone are not good GARP indicators unless combined with ORP
- Wells with positive ORP, especially springs, are more likely to contain surface water organisms

Questions?



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