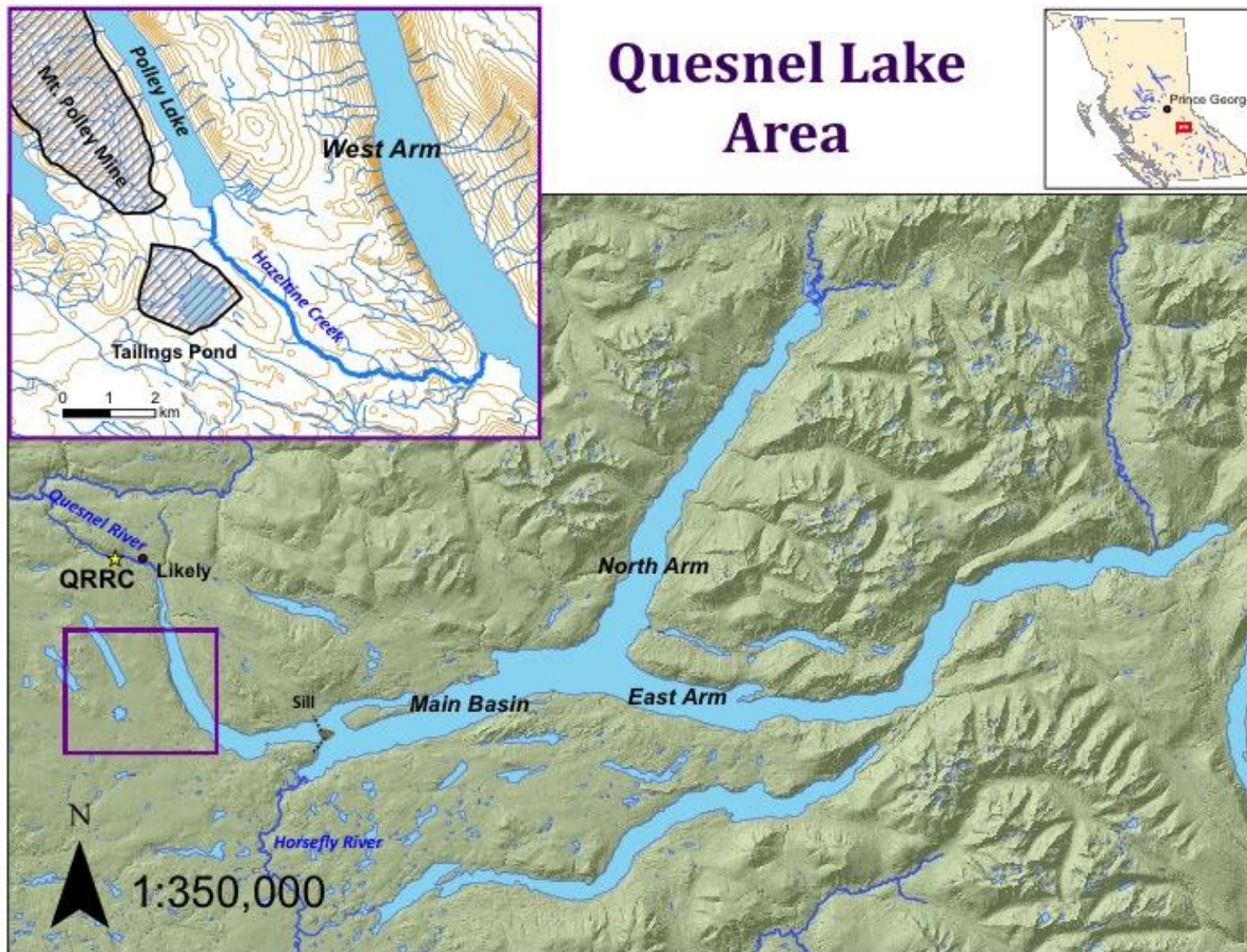


## Impacts of the Mount Polley Mine Spill on Quesnel Lake: An Update from UNBC's Quesnel River Research Centre



# Location



# The Quesnel River Research Centre



Used to be a DFO fish hatchery

Now a UNBC research station  
funded through a Forest  
Renewal BC (FRBC)  
endowment in Landscape  
Ecology focusing on aquatic  
processes and systems in  
watersheds

# Quesnel Lake – The nursery



# What happened?



NASA image of Mt Polley Mine site and retention pond: pre-spill July 29, 2014

NASA image of Mt Polley Mine site and retention pond: post-spill August 5, 2014

Note Hazeltine Creek channel widening and debris in Quesnel Lake



# Hazeltine Creek: terrestrial impacts



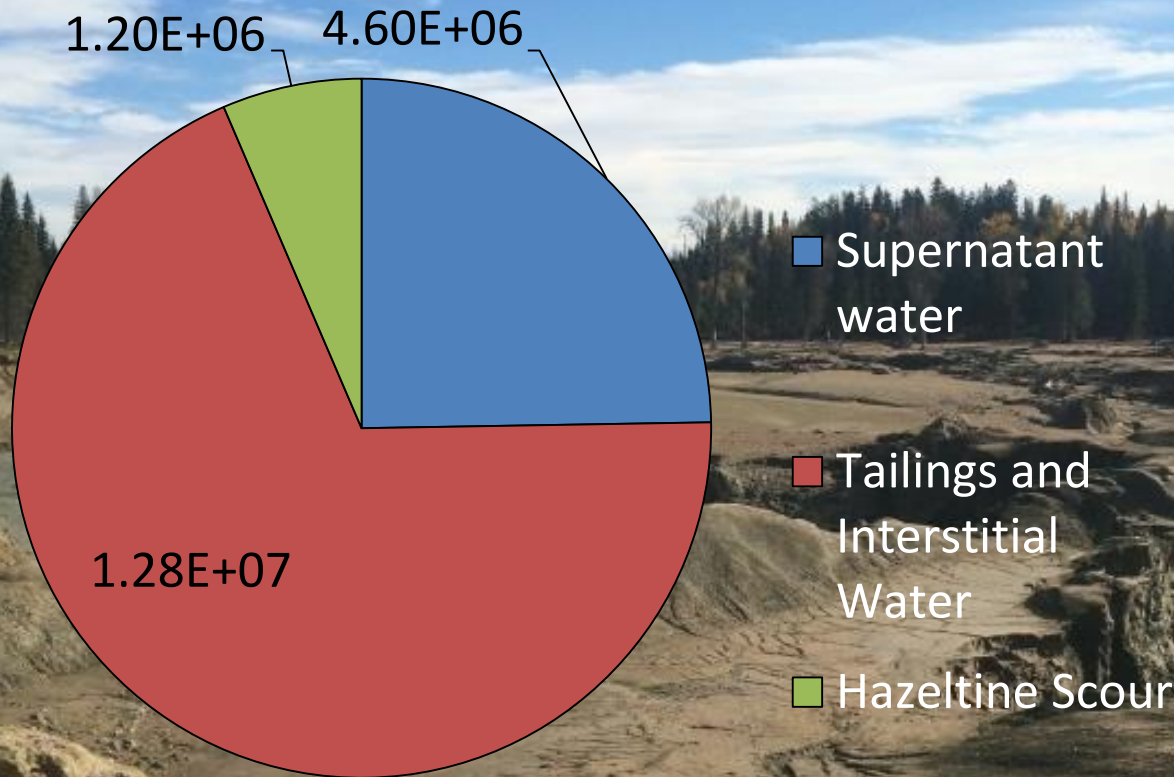
October 2008

October 2014



# What came into the lake?

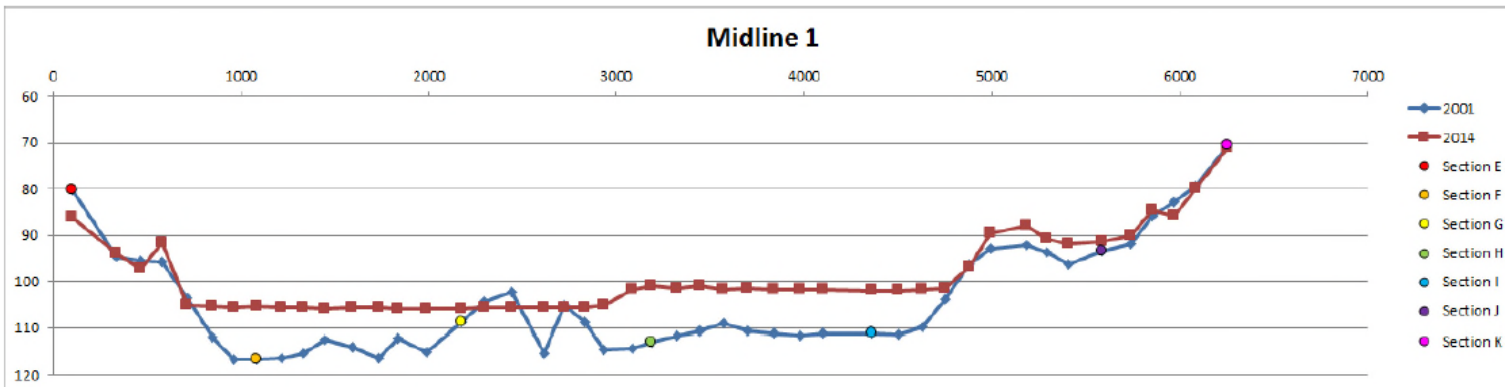
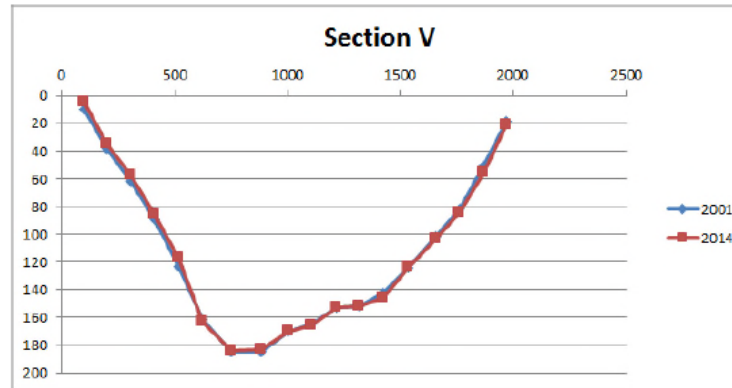
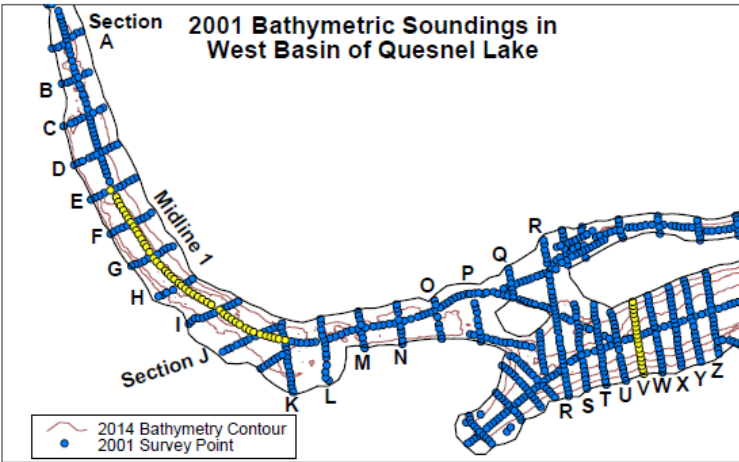
18.6M cubic metres



Data from PEEIAR 2015

# The West Basin deposit

- Deposit is between 5 and 10 m deep



## NOTES

Section depths and distances are in metres.  
The vertical datum is the zero of the WSC lake level gauge at Likely.  
Horizontal distances are measured from an arbitrary point.

Inset map shows locations of 2001 bathymetry survey points, with sections labeled.  
Contours are 2014 depths at 50-m intervals.

STATUS  
ISSUED FOR USE

CLIENT

MPMC



TETRA TECH EBA

BATHYMETRY ANALYSIS AND  
VOLUME BALANCE

Bathymetry Comparison:  
2001 Versus 2014 Data

PROJECT NO. V13203212	DWN DP	CKD JAS	APVD JAS	REV 0
OFFICE Tetra Tech EBA - VANC	DATE April 30, 2015			

Figure 4.3

Page 345  
of PEEIAR



# Scientific response – Areas of focus

- Tracking the plume
- Characterizing the sediment
- Monitoring food web



# Contributors to early research efforts



Ministry of Environment



Fisheries and Oceans  
Canada



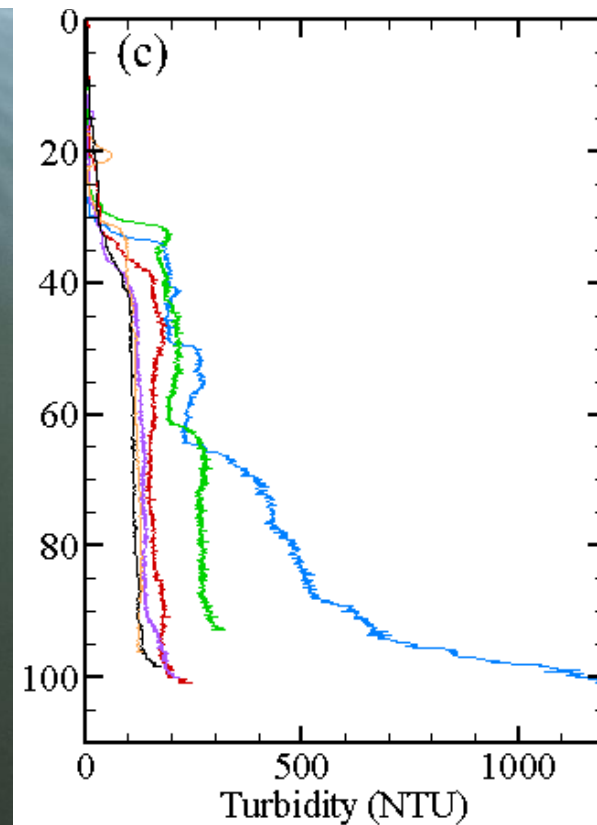
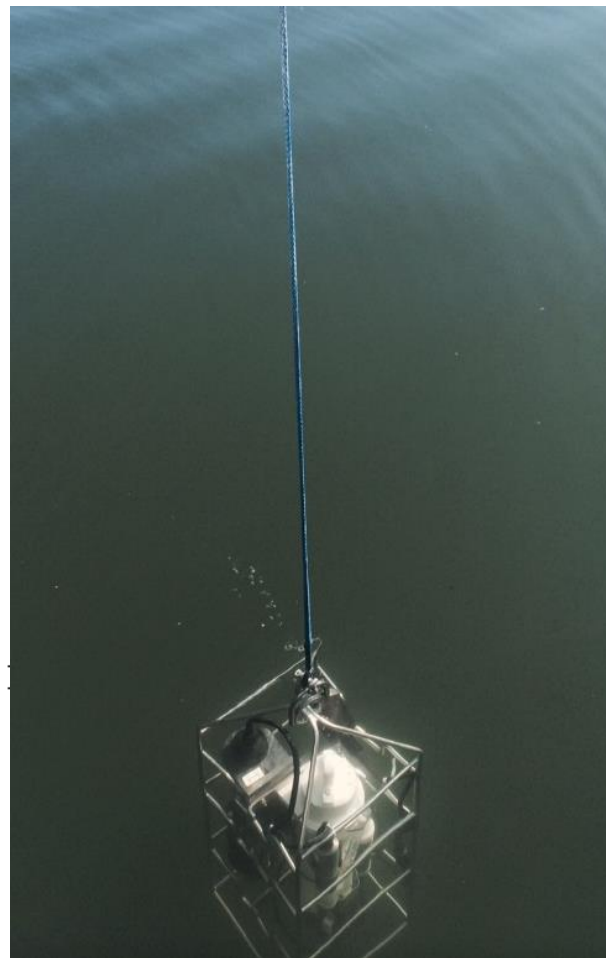
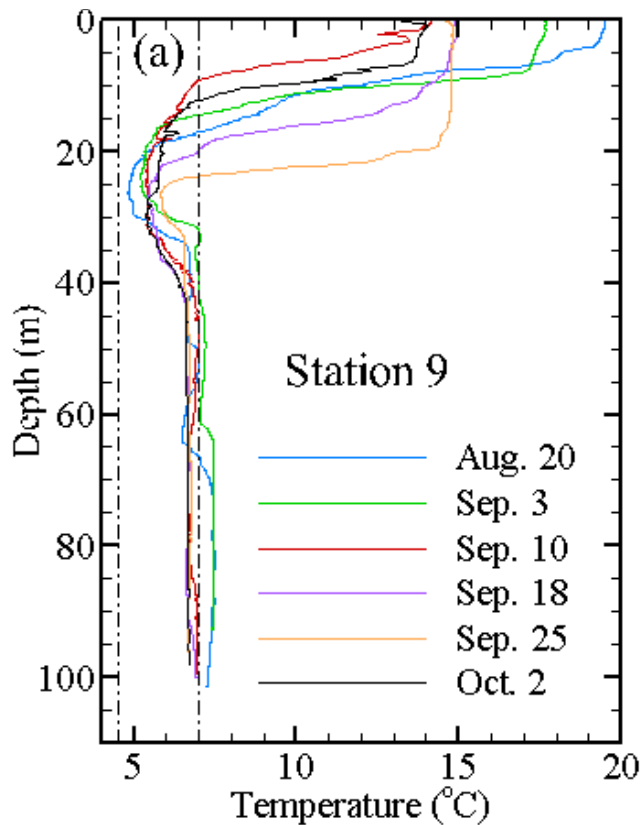
**INNOVATION.CA**

CANADA FOUNDATION FOR INNOVATION | FONDATION CANADIENNE POUR L'INNOVATION

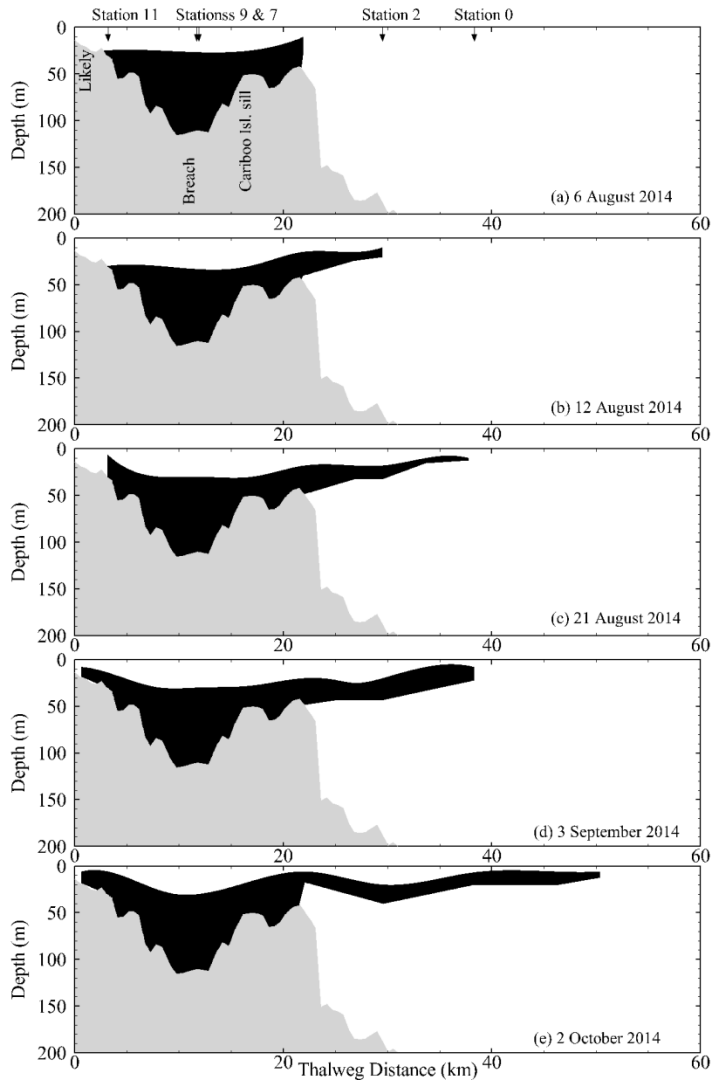


# Post-breach water column conditions

West Basin, lakeward of Hazeltine Creek



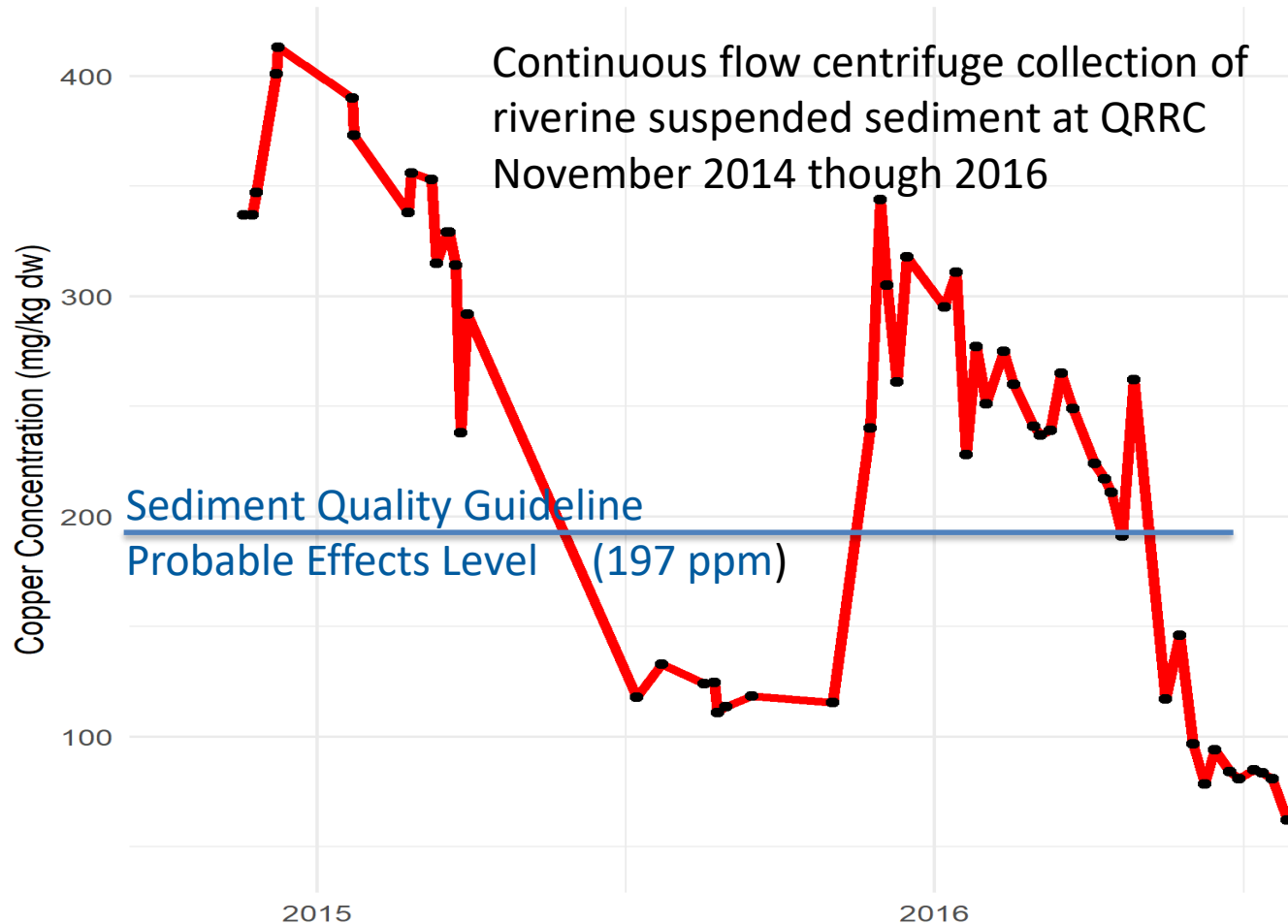
# Plume progression



Plume spreading eastward at  
 $\sim 1\text{cm/s}$ .

# Quesnel River Response to Loadings from the Mine Spill

## Concentrations of copper on river sediment



Source: Owens et al. (in preparation)

# Environment and Climate Change Canada

# Environmental Damages Funding

This project was undertaken with the financial support  
of the Government of Canada.  
Ce projet a été réalisé avec l'appui financier  
du gouvernement du Canada.



## Physical Limnology

Bernard Laval (UBC)  
Stephen Déry (UNBC)  
Svein Vagle (IOS)  
Eddy Carmack (IOS)

## Sediment-Water Interactions

Ellen Petticrew (UNBC)  
Phil Owens (UNBC)  
Sue Baldwin (UBC)

## Biological Responses

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Sam Albers (UNBC/MOE)  
Dan Selbie (DFO)

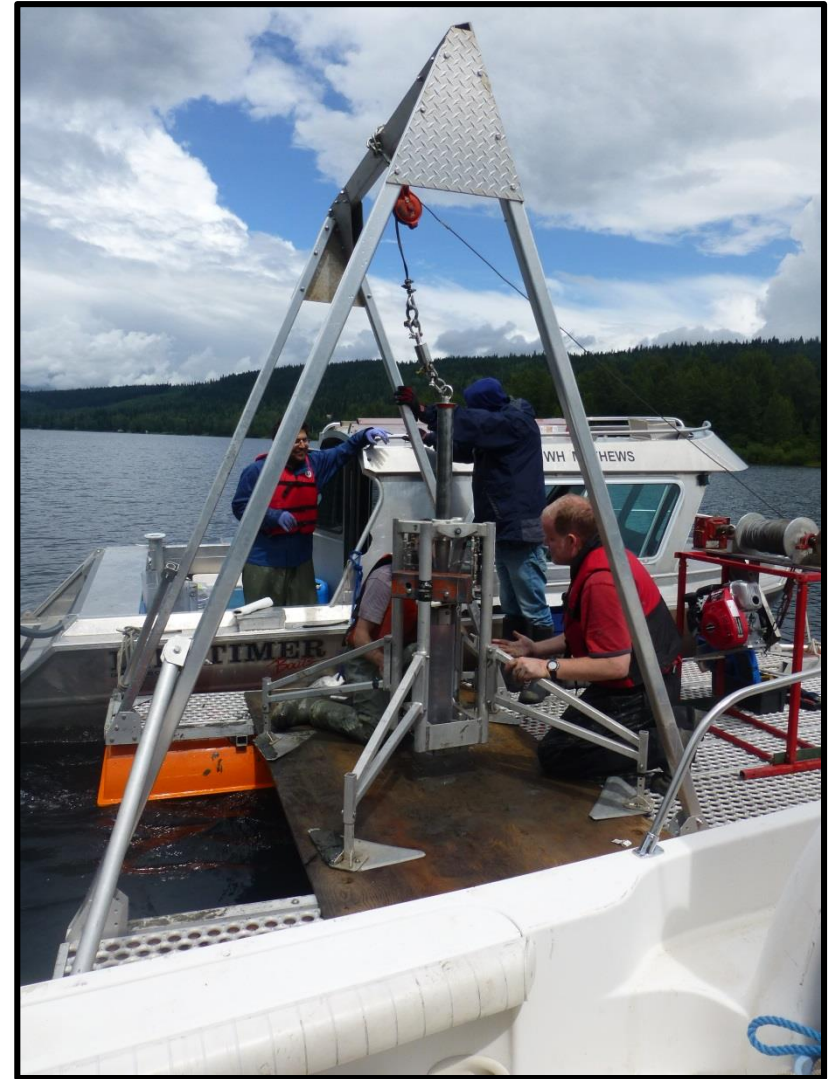
Data Sharing and  
Information Linkages

Michael Allchin (QRRC)  
Laszlo Enyedy (QRRC)  
Todd French (QRRC/UNBC)

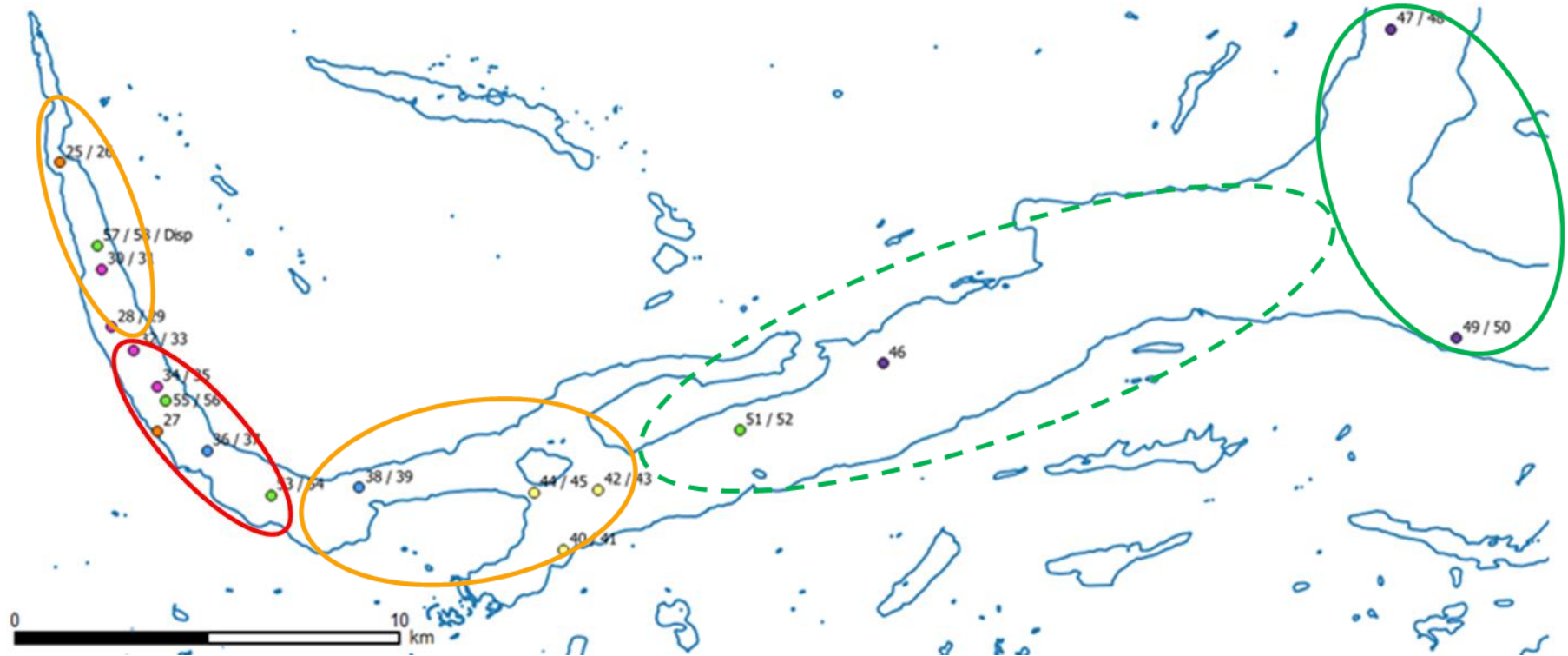
Many graduate students and research assistants

# Environmental Damages Fund Supported Research : 2016

Collecting surface (top 50 cm) cores of the tailings material and lake sediment – especially the sediment – water interface



# Slo-corer sites, July 2016



Impact Zone

Halo Region

?Disturbed?

Undisturbed



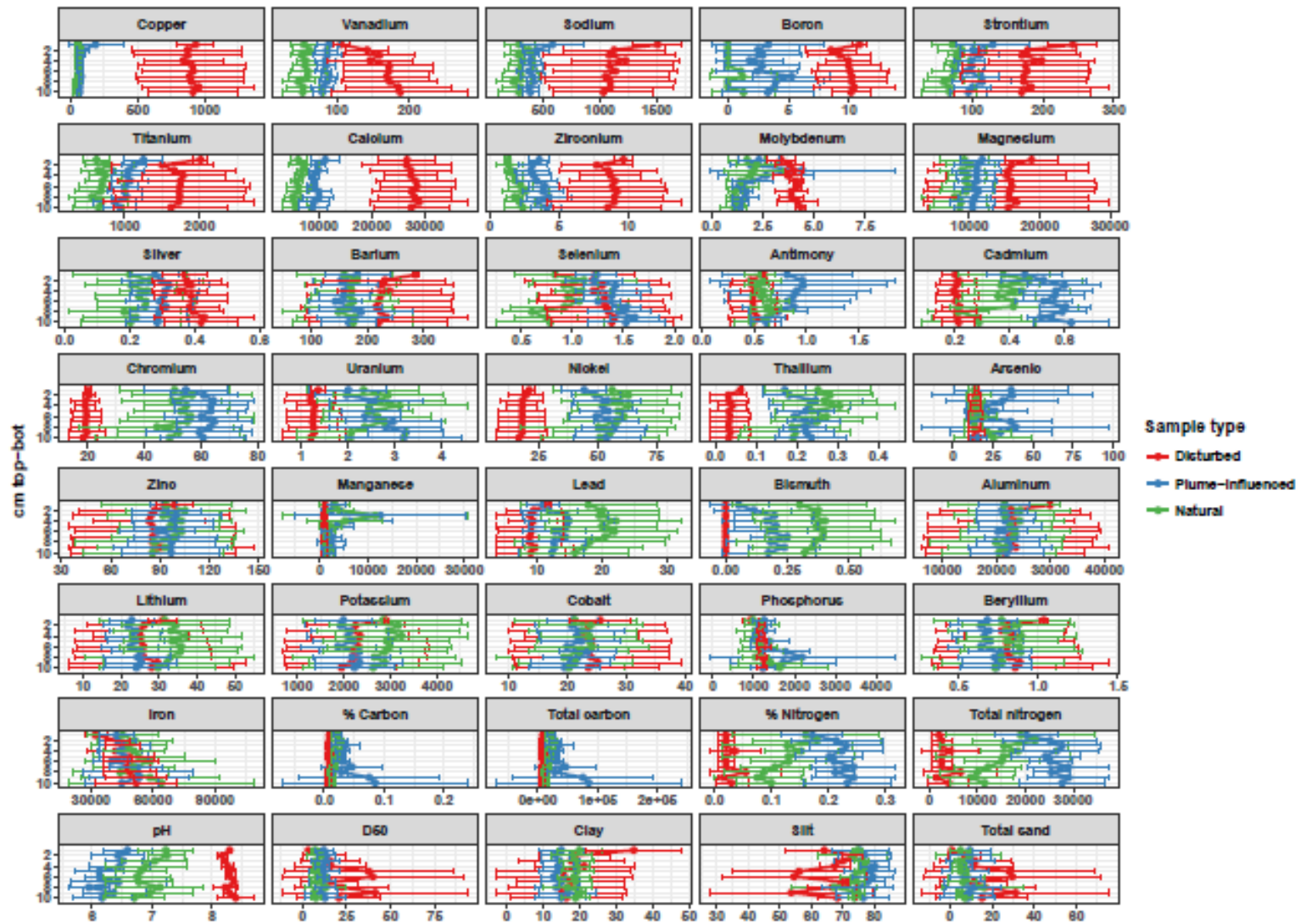
# Core retrieval impact zone



# The “halo” zone vs Undisturbed sites

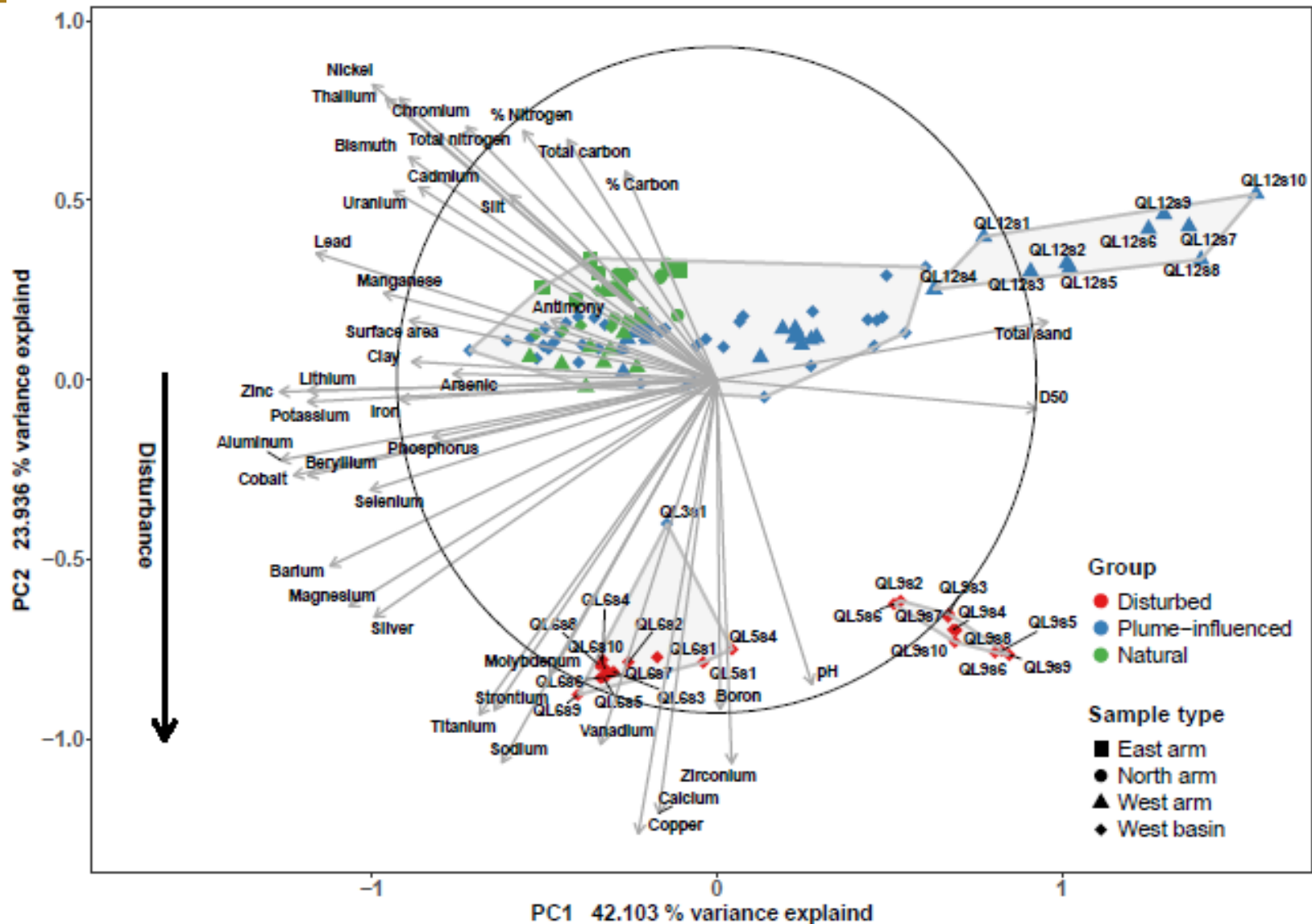


# Downcore metal profiles in lake bottom materials



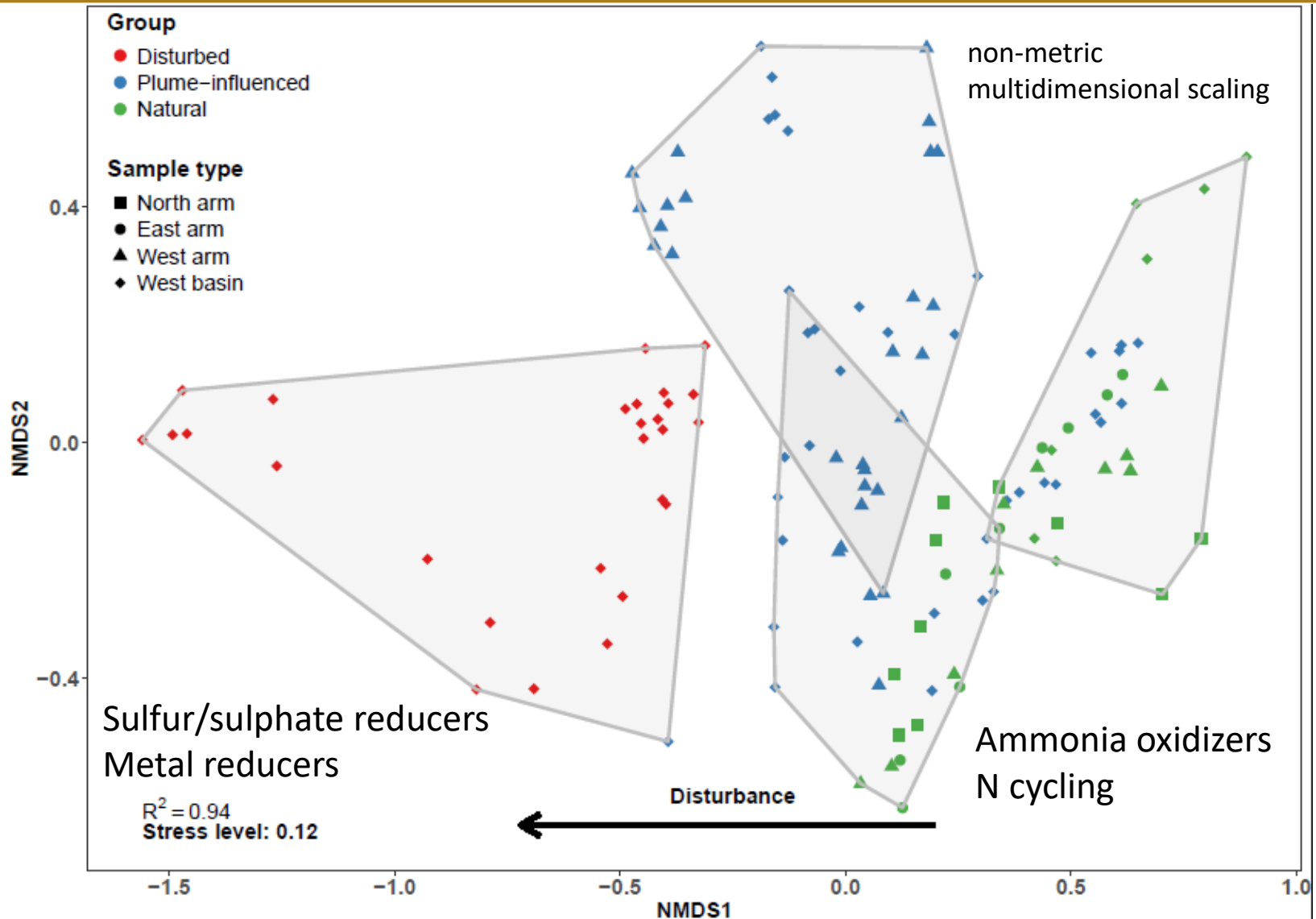
Source: Hatam et al. (2019, Scientific Reports)

# Differentiating zones of lake bottom sediment



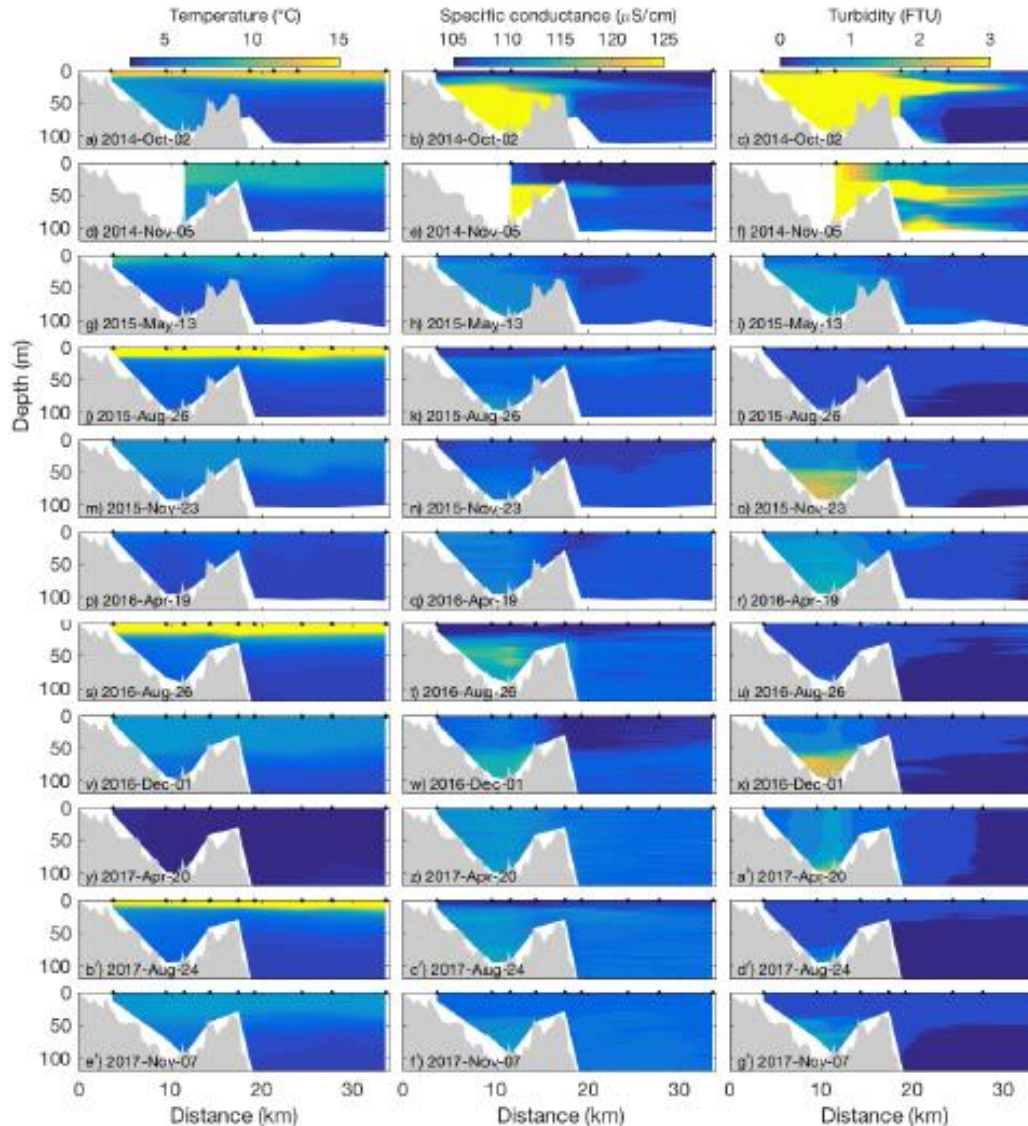
Source: Hatam et al. (2019, Scientific Reports)

# Differentiating microbial composition of sediment



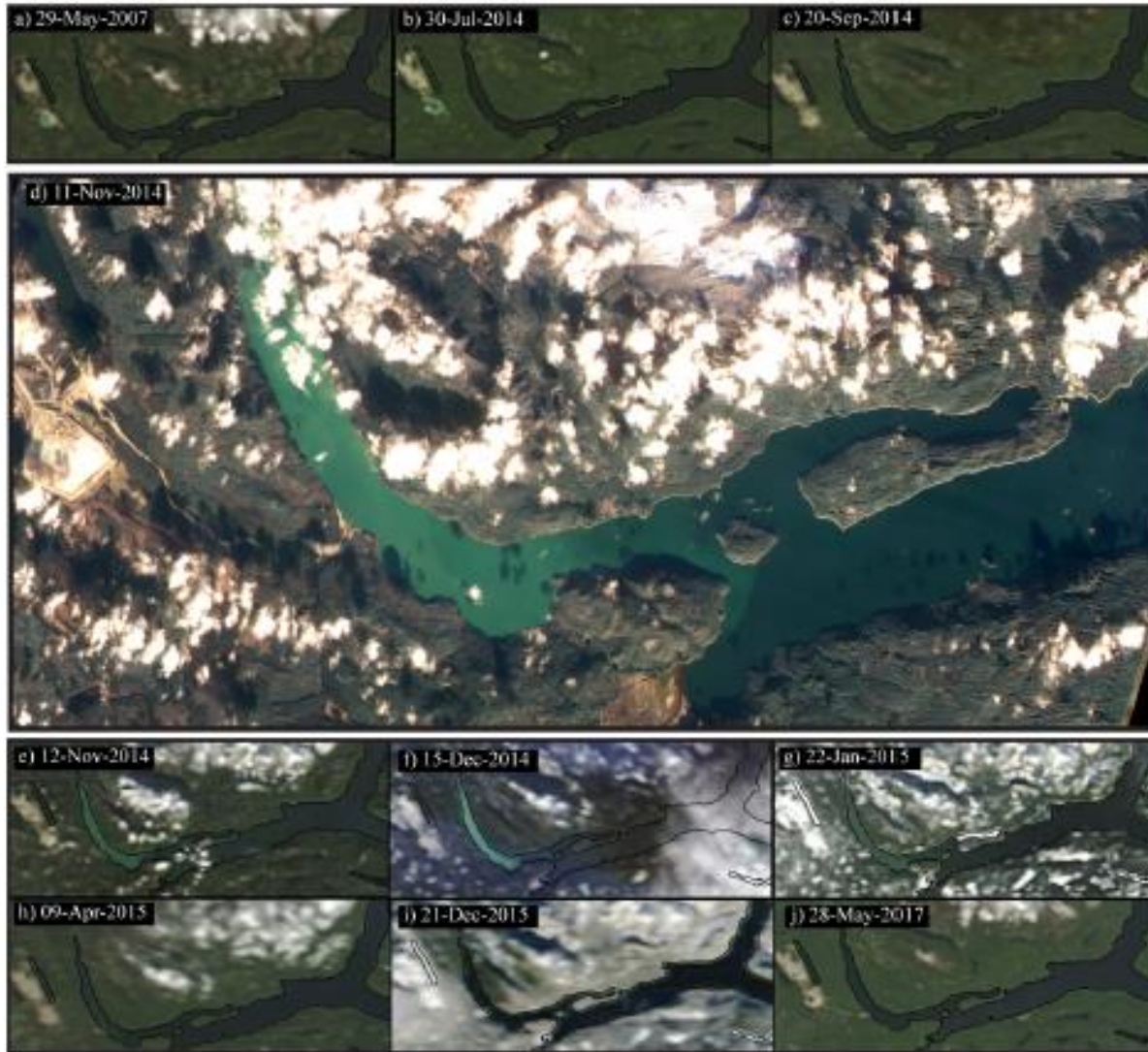
Source: Hatam et al. (2019, Scientific Reports)

# Physical limnology work by UBC and QRRC



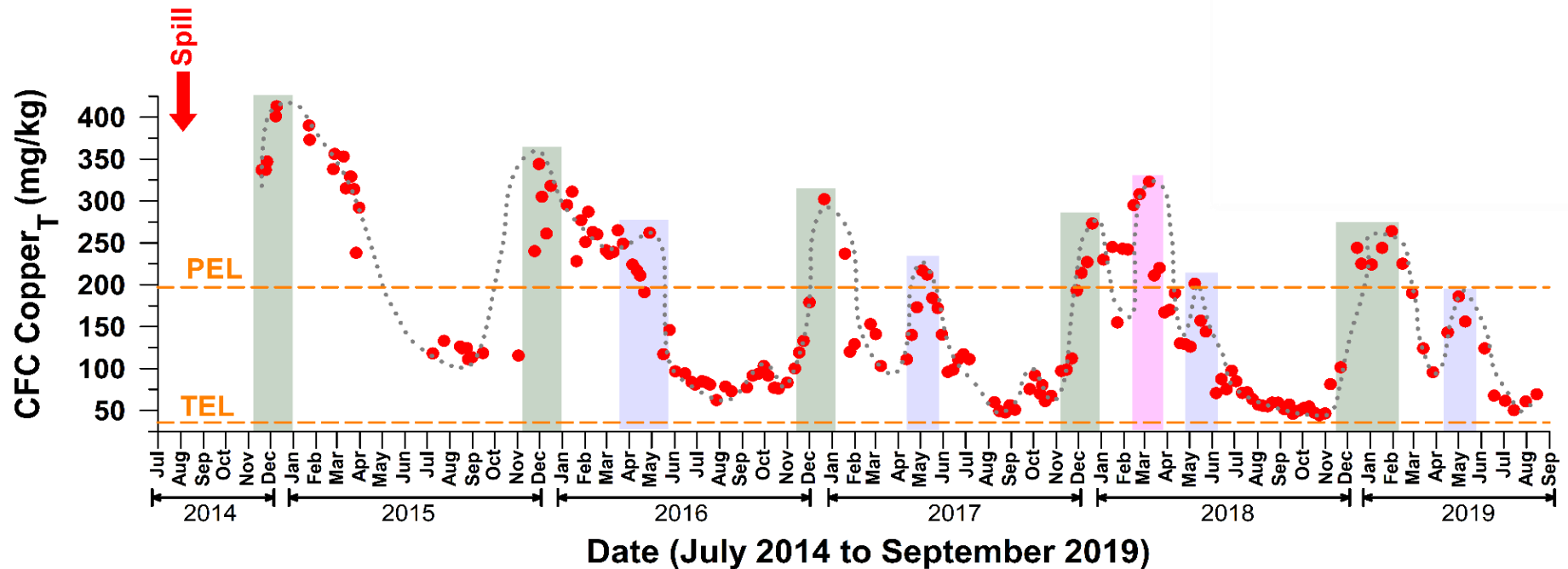
Source: Hamilton et al. (2020). Water Resources Research

# Physical limnology work by UBC and QRRC



Source: Hamilton et al. (2020). Water Resources Research

# Overturn/Springmelt elevation of Copper on river sediment continues



Source: Owens et al. (in preparation)



# Findings

Plume of fine sediment remained in suspension for months and moved up-lake and down-lake into Quesnel River

Copper concentrations of material on the bottom of the lake, in places, are over 6 times the SQG and 10-20 times reference/background values

Evidence suggests the tailings bottom layer is mobile, supports a different microbial community and is resuspended into the water column

Copper concentrations in Quesnel River sediment match the magnitude and timing of resuspension (lake overturn) in Quesnel Lake's West Basin

Biota (biofilm, plankton and invertebrates) show higher levels of metals closer to where the breach entered the lake

# Collaborations: UNBC-QRRC, UBC, U Lethbridge & DFO With support from ECCC & MoE and community of Likely

Questions and discussion



Special thank you to Todd French, Laz Ehyedy and Michael Allchin

2016/07/16