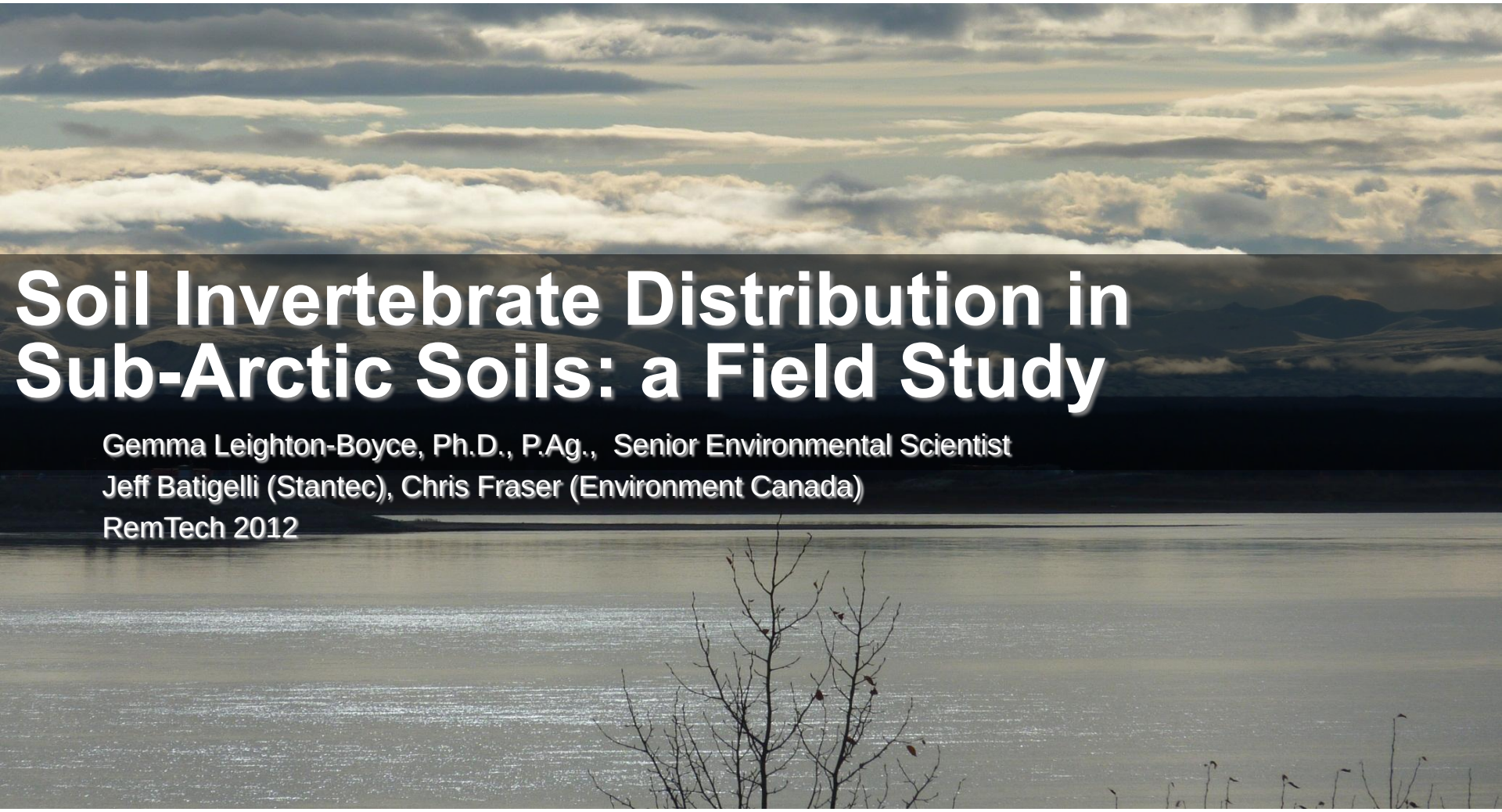
WorleyParsons

resources & energy

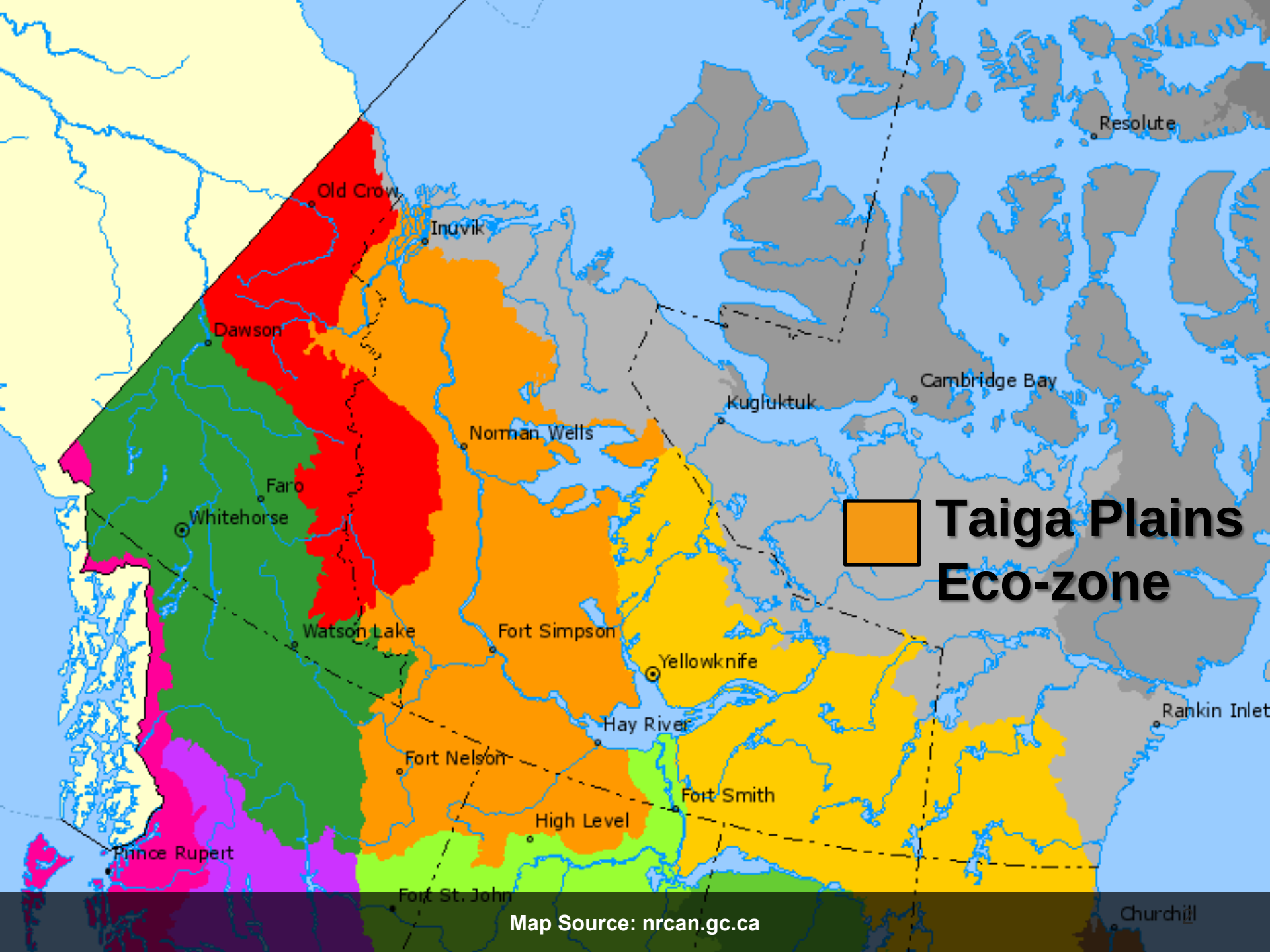


Soil Invertebrate Distribution in Sub-Arctic Soils: a Field Study

Gemma Leighton-Boyce, Ph.D., P.Ag., Senior Environmental Scientist
Jeff Batigelli (Stantec), Chris Fraser (Environment Canada)

RemTech 2012

EcoNomics


Resolute
Old Crow
Inuvik
Dawson
Cambridge Bay
Kugluktuk
Norman Wells
Faro
Whitehorse
Taiga Plains
Eco-zone
Watson Lake
Fort Simpson
Yellowknife
Rankin Inlet
Hay River
Fort Nelson
Fort Smith
High Level
Prince Rupert
Fort St. John
Churchill
Map Source: nrcan.gc.ca

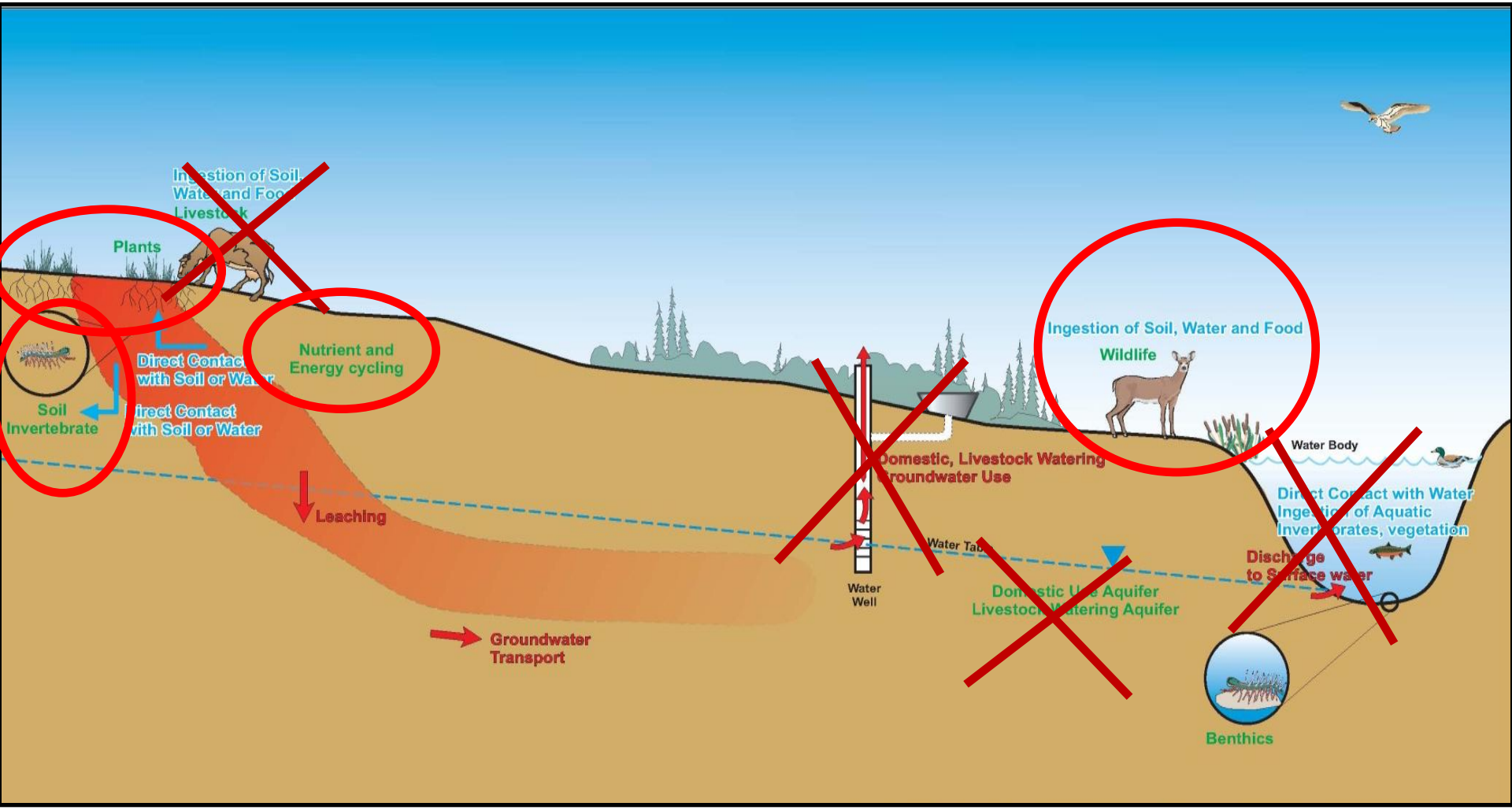
Significance of Soil Invertebrates in Contaminated Site Assessment

Table 1. Receptors and Exposure Pathways for the Land Use Categories Considered in the Derivation of Environmental Soil Quality Guidelines

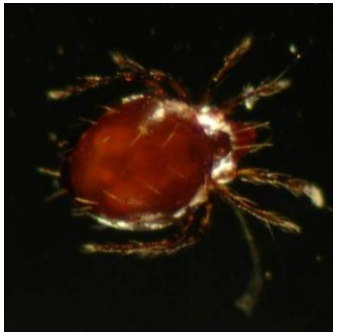
Route of Exposure	Agricultural	Residential/ Parkland	Commercial	Industrial
Soil Contact	Soil Nutrient Cycling Processes, Soil Invertebrates, Crops/Plants, Livestock/Wildlife	Soil Nutrient Cycling Processes, Soil Invertebrates, Plants, Wildlife	Soil Nutrient Cycling Processes, Soil Invertebrates, Plants, Wildlife	Soil Nutrient Cycling Processes, Soil Invertebrates, Plants, Wildlife
Soil & Food Ingestion	Herbivores, Secondary and Tertiary Consumers	Herbivores, Secondary and Tertiary Consumers		
Ingestion of Contaminated Water	Livestock			
Contact with Contaminated Water	Freshwater Life, Crops (irrigation)	Freshwater Life	Freshwater Life	Freshwater Life

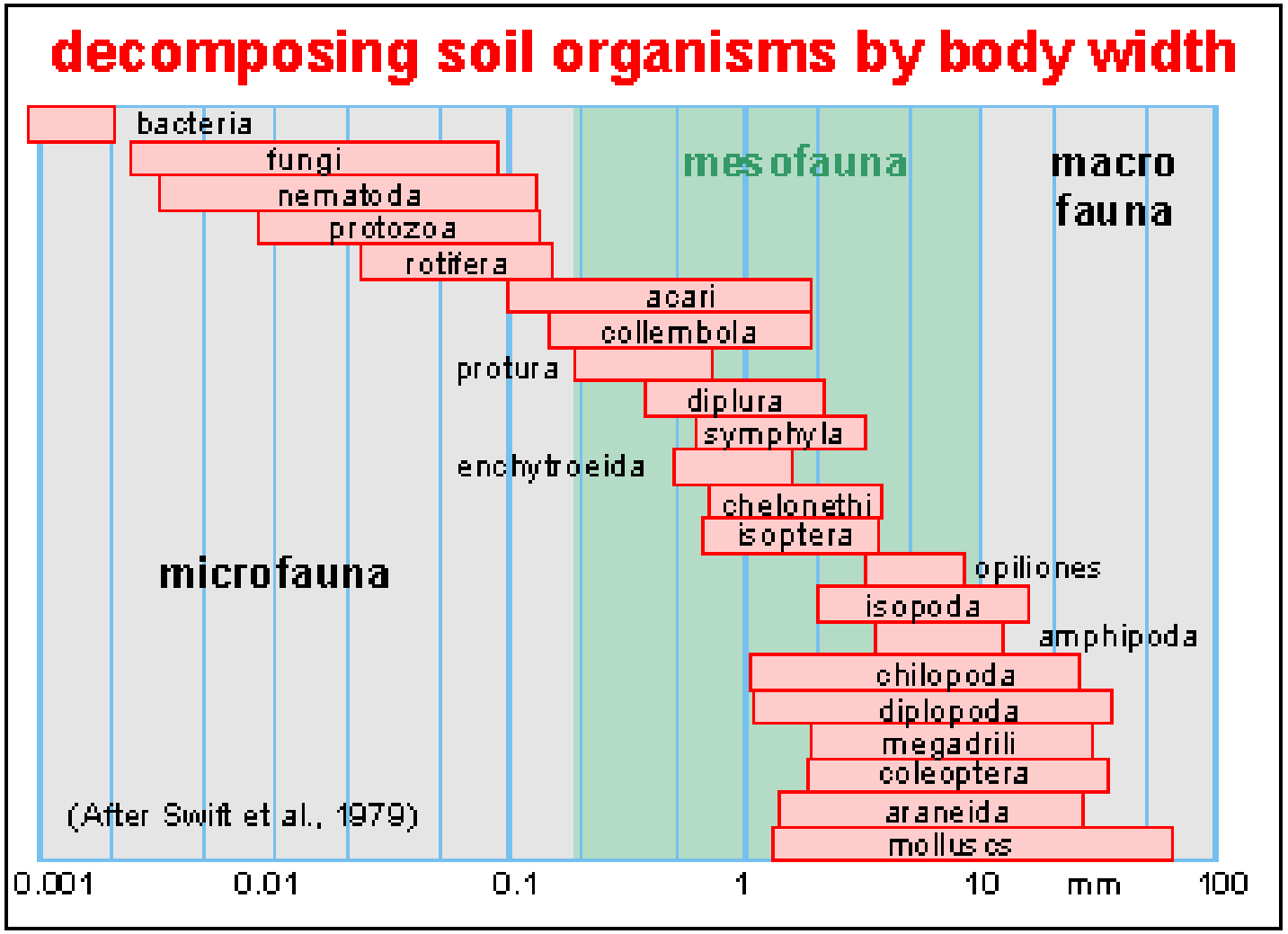
Source: CCME Protocol for Derivation of Environmental and Human Health Soil Quality Guidelines

Significance of Soil Invertebrates in Risk-Based Contaminated Site Assessment Under Natural Land Uses



What are we looking for ?





Sample collection

- Six sites
- Three test pits per site
- Soil cores every 5 cm (0-20 cm), thereafter every 50 cm

2 sites
Max. depth 3 m

4 sites
Max. depth <1m

Challenges

Heat Extraction & Preservation

Dissecting Scope: Coarse Sorting

Results: Range of Fauna

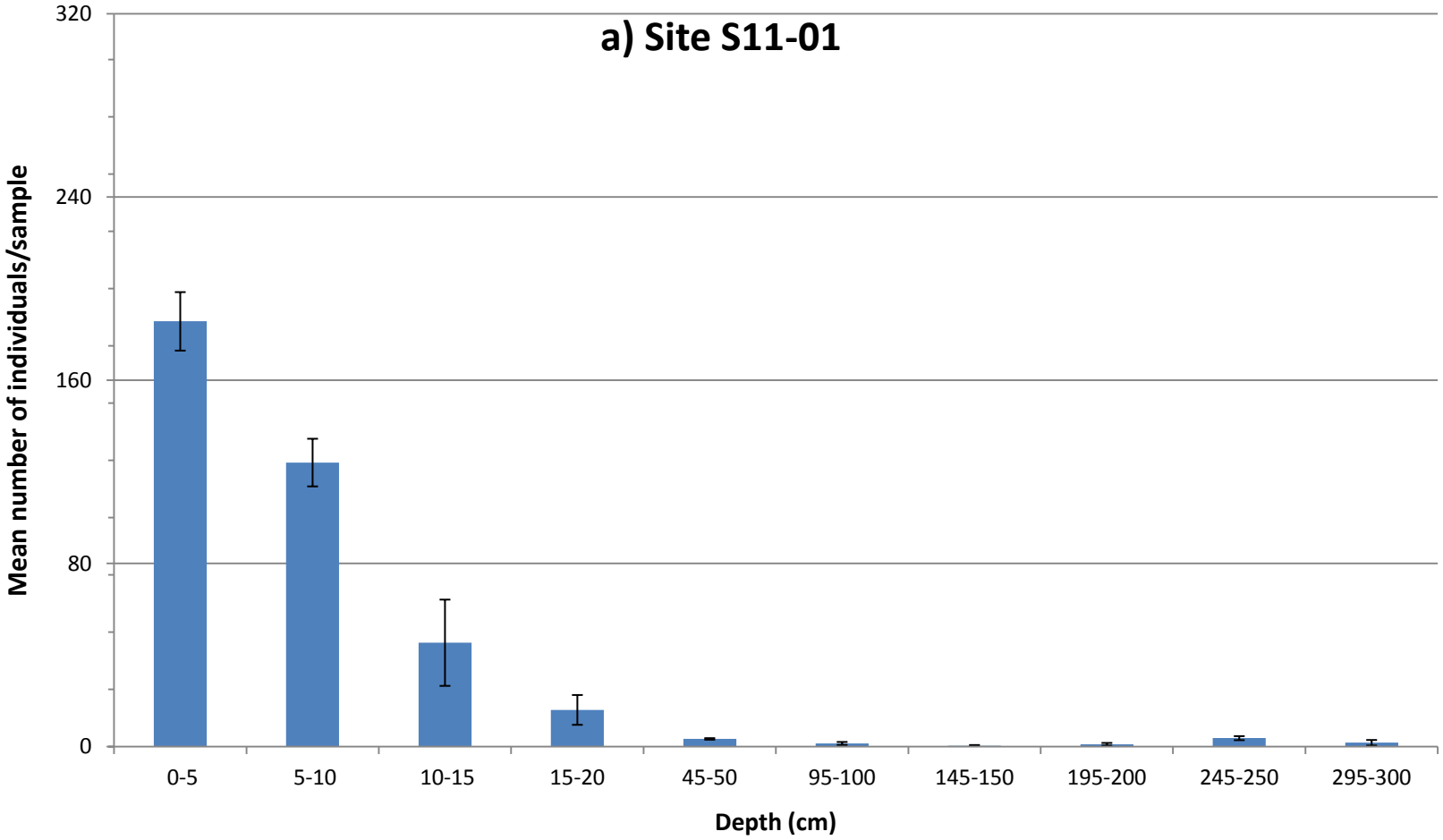
- *Acari* or Soil Mite
  - *Oribatida, Mesostigmata, Prostigmata*

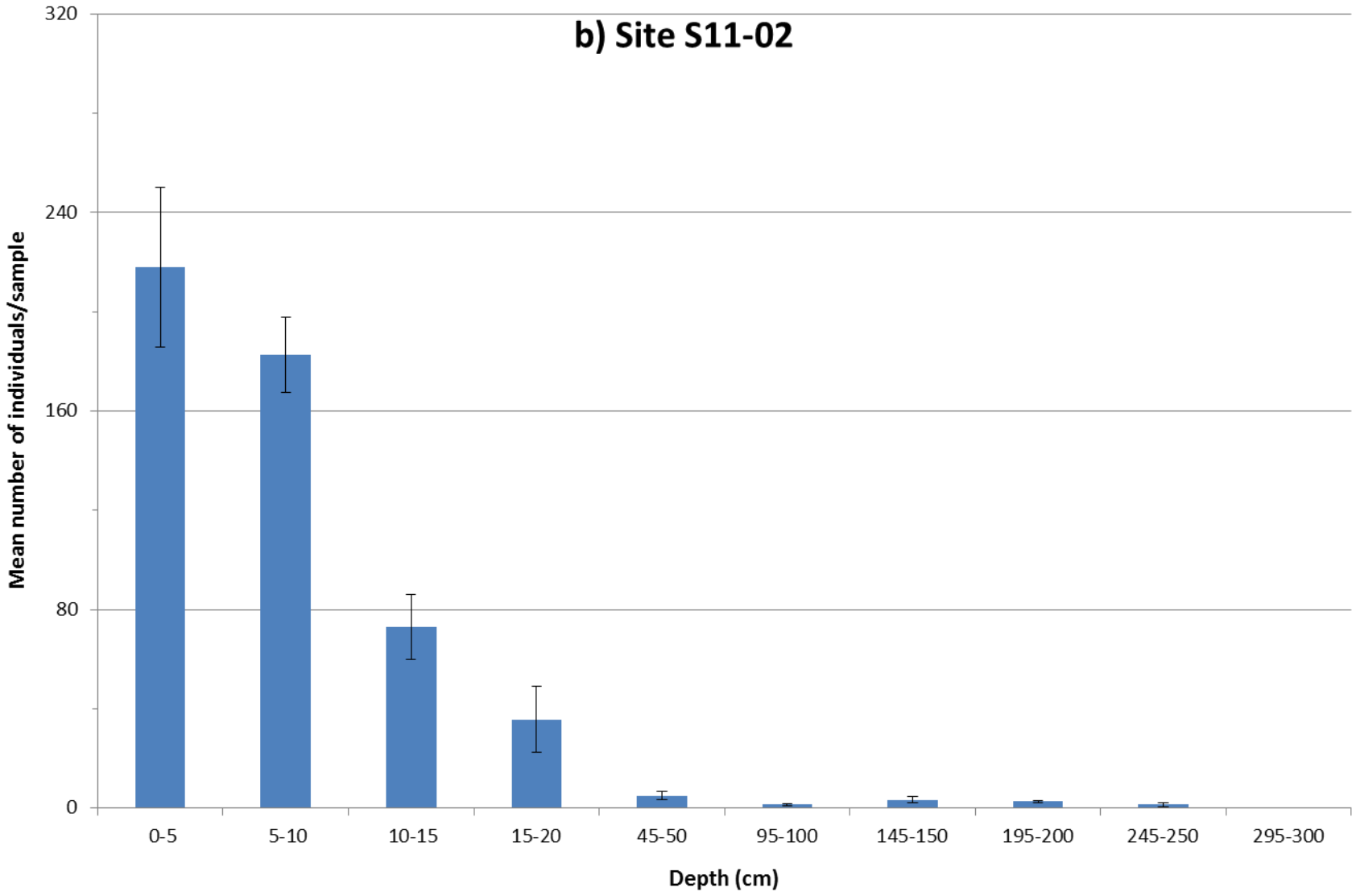
- *Collembola* or Springtail
  - *Entomobryidae, Isotomidae, Hypogastruridae, Neelidae, Onychiuridae, Sminthuridae*

- Dominance of Acari (71-93% of individuals) over Collembola (5-25%)

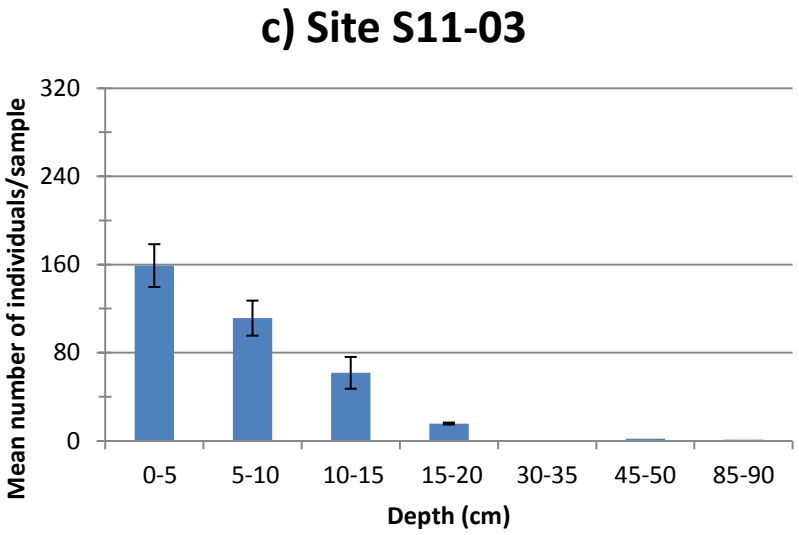
- ‘Others’ *Coleoptera* larvae*, Diptera, Thysanoptera, Aranaea, Chilopoda, Homoptera, Nematoda, Protura*

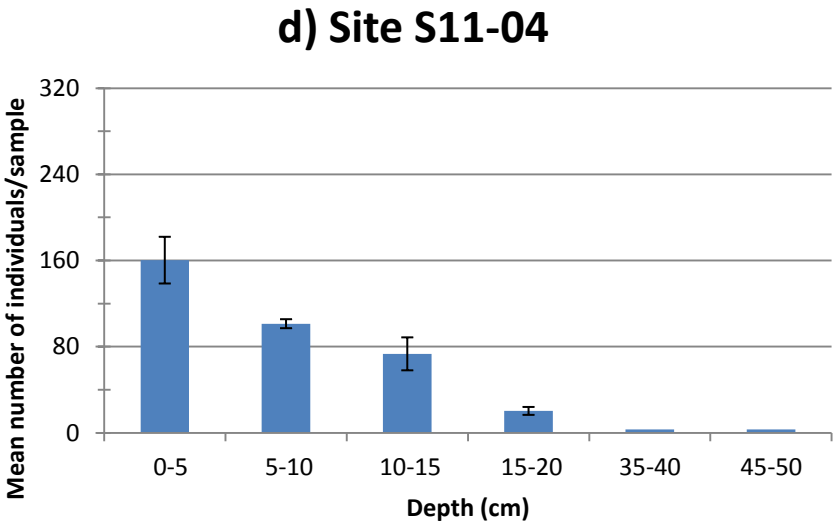
Results: profile distribution

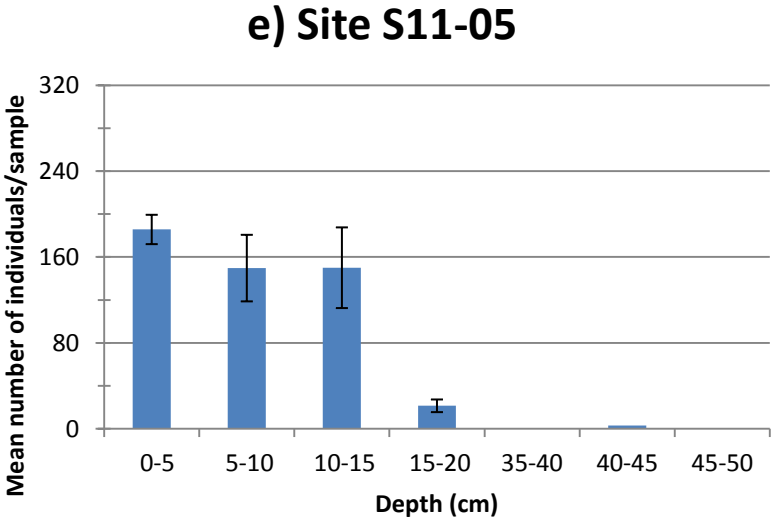


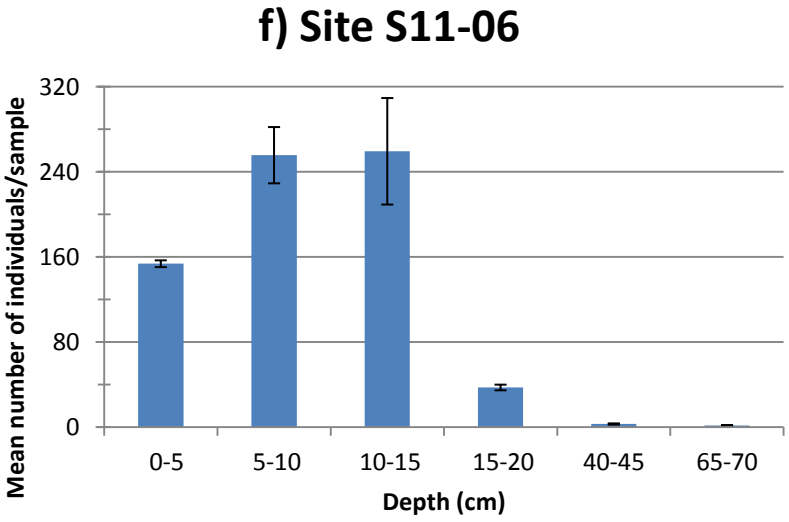

b) Site S11-02
Mean number of individuals/sample
320
240
160
80
0
0-5
5-10
10-15
15-20
45-50
95-100
145-150
195-200
245-250
295-300
Depth (cm)

Results: Profile Distribution at Permafrost Sites

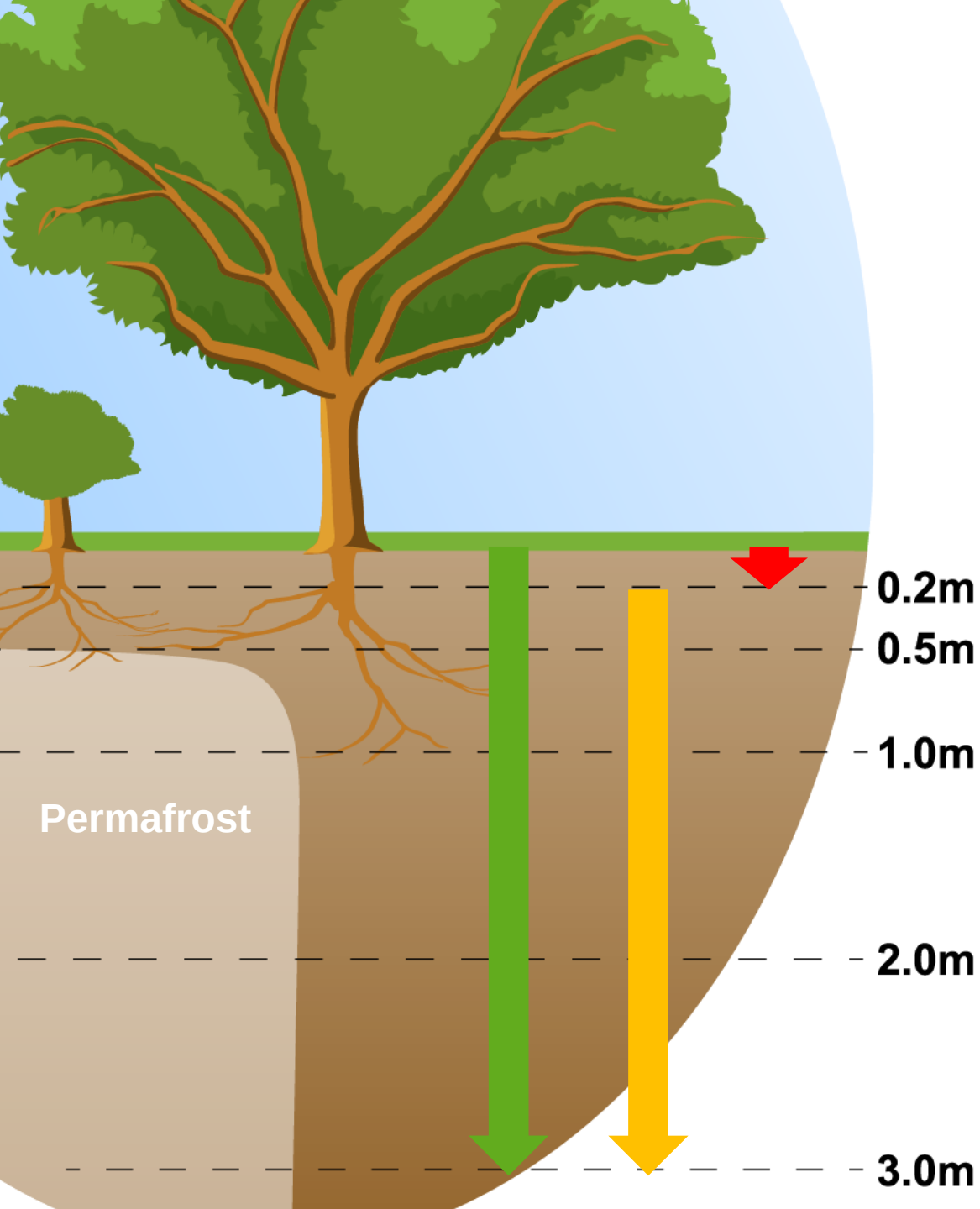








Results: Implications



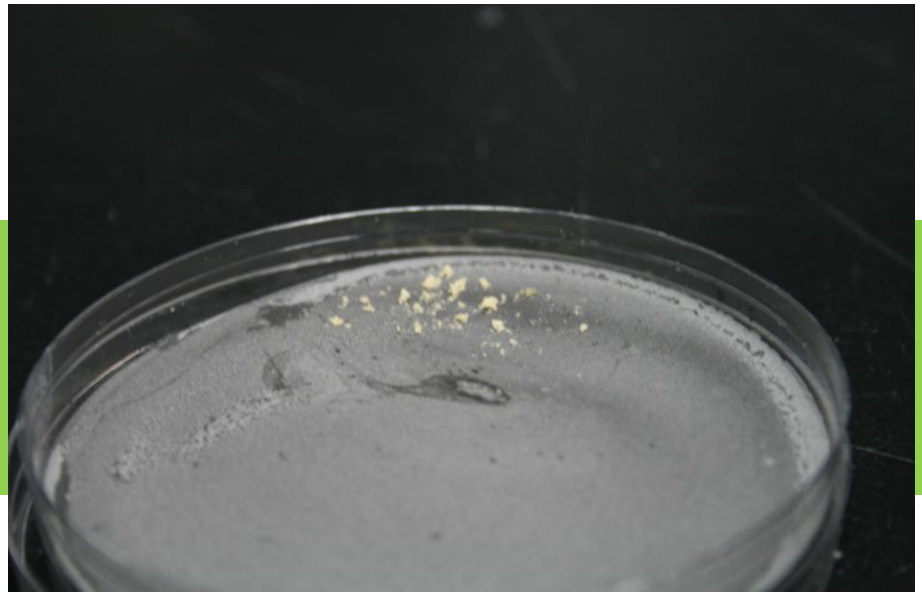
97-99% of soil fauna

1-3% of soil fauna

CCME eco-contact guidelines

Next steps: Culturing Select Species

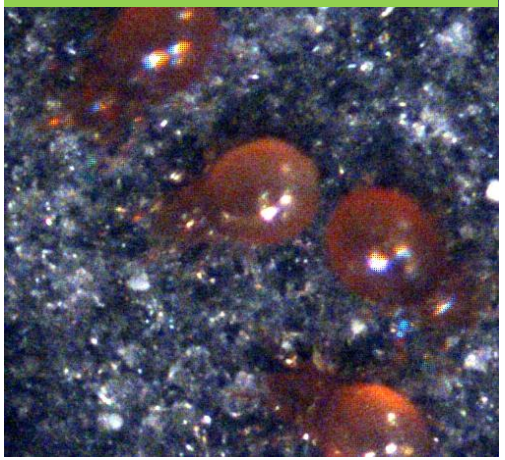
Heat extraction



Collembola eggs

Current Surviving Individuals

Mite



Springtail ‘long thin’

Springtail ‘purple grey’

Springtail ‘fat white’

Summary

Knowledge of soil fauna in northern regions	Study findings	Implications for use of generic guidelines	Next steps for Taiga soil fauna
Limited; few studies	Majority of fauna in top 20 cm	Relevance to regional species?	Culturing and method development
Critical component of a healthy soil	Low numbers of fauna reported at 3 m; distinct community?	Application depth?	Guideline development

Environment Canada

Environnement Canada

WorleyParsons

resources & energy