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EcoNomics™

WATER MOVEMENT IN FREEZING PEAT: LABORATORY INVESTIGATIONS

Ranjeet M. Nagare, Ph.D





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BACKGROUND

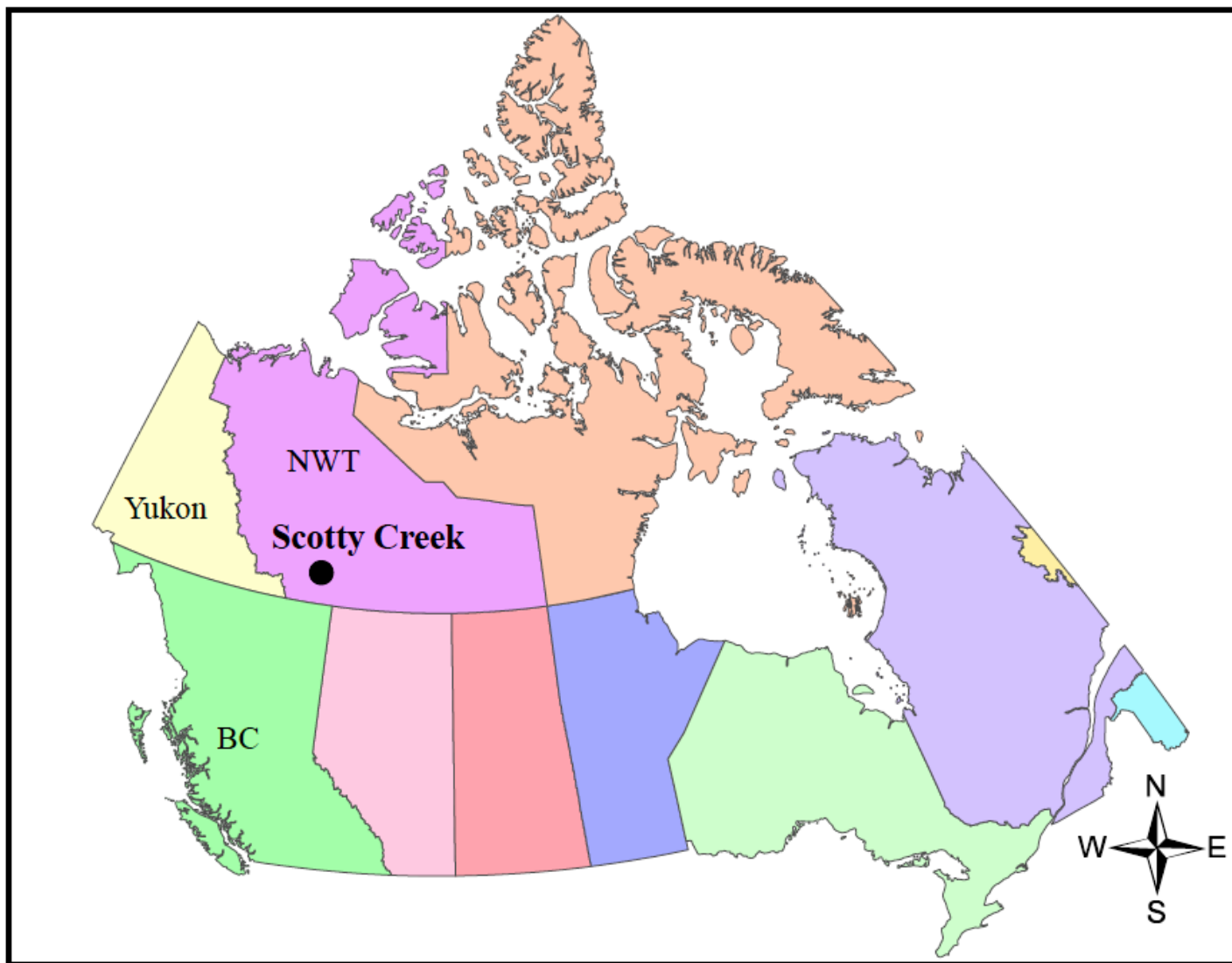


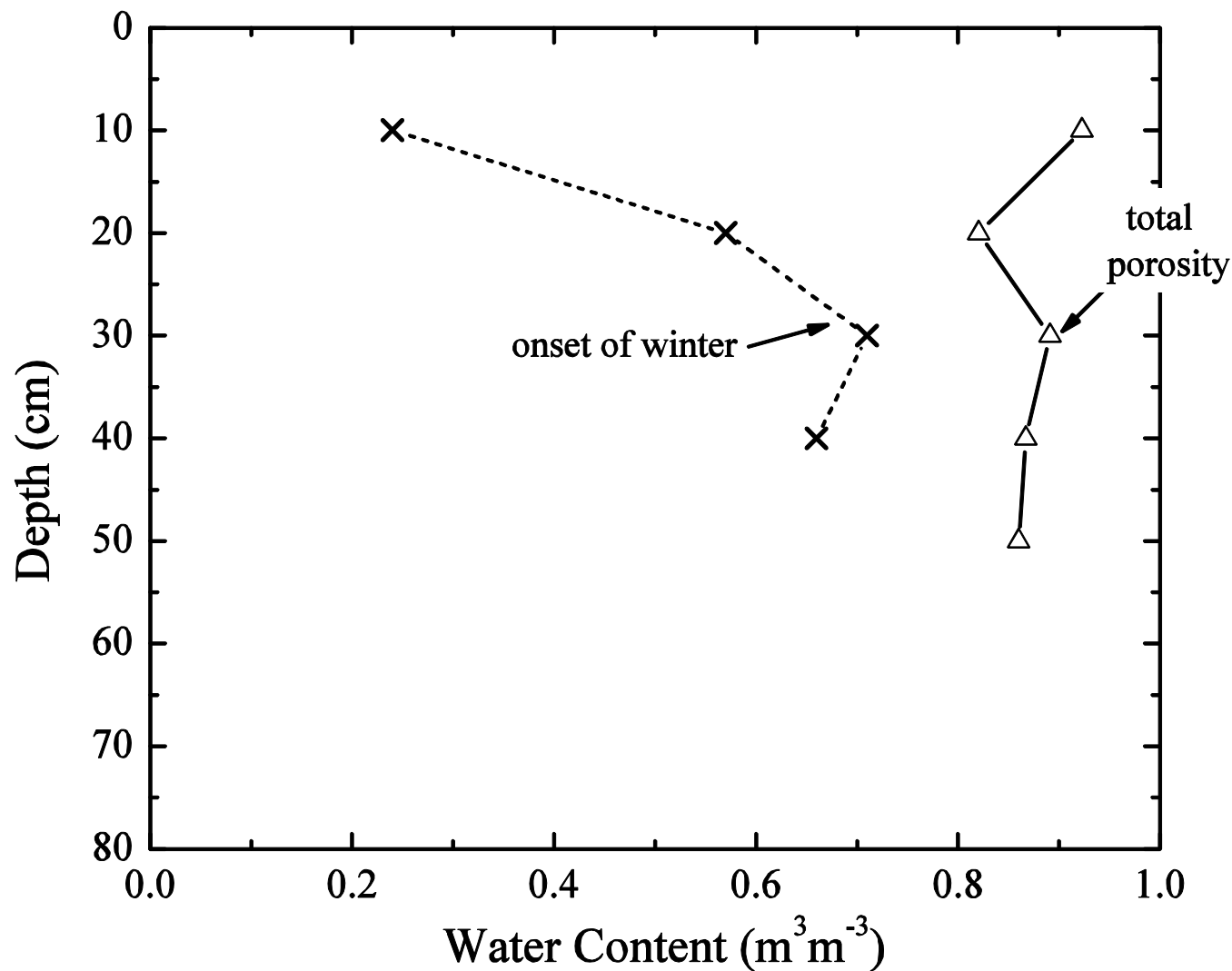


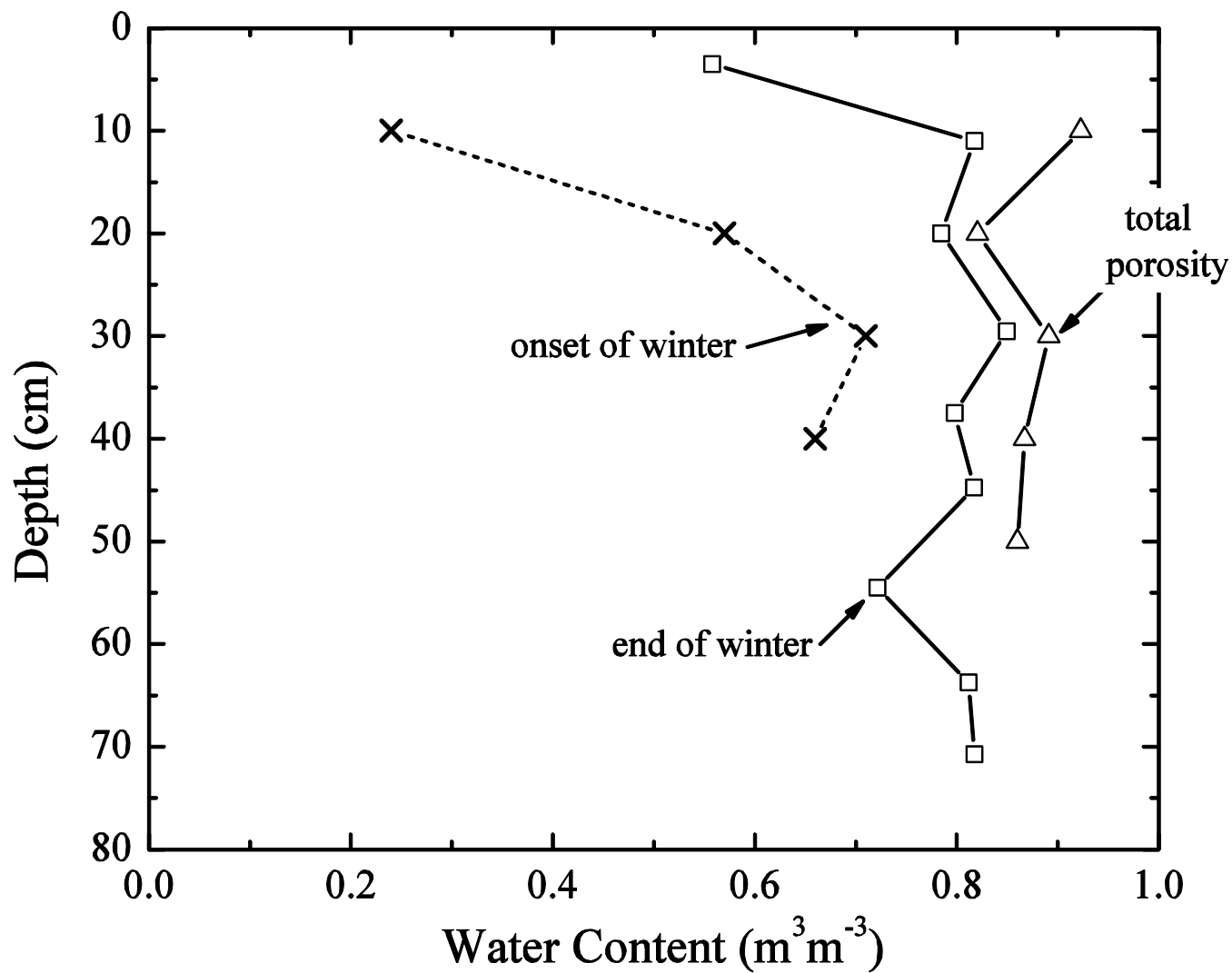
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FIELD STUDY SITE

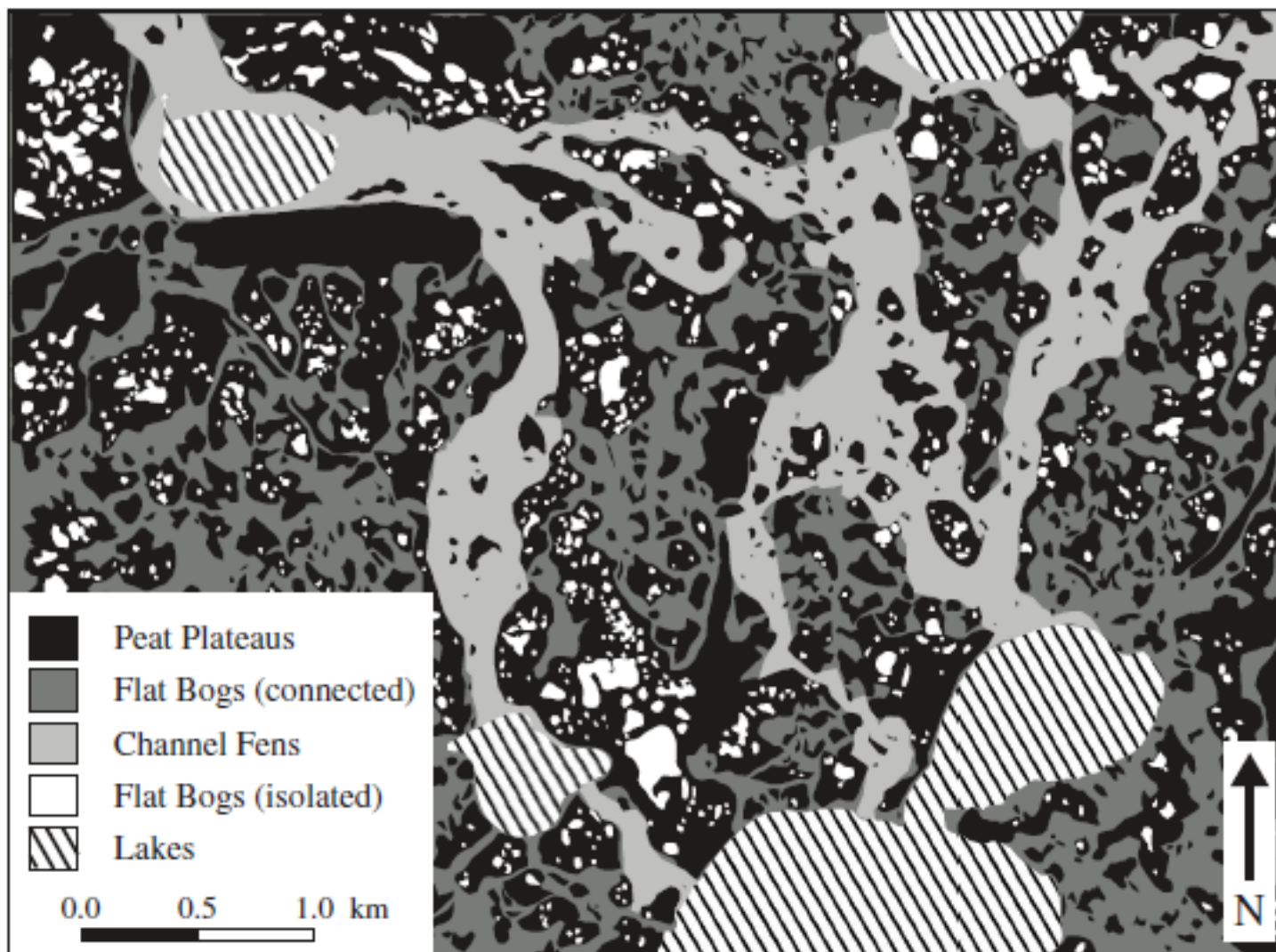


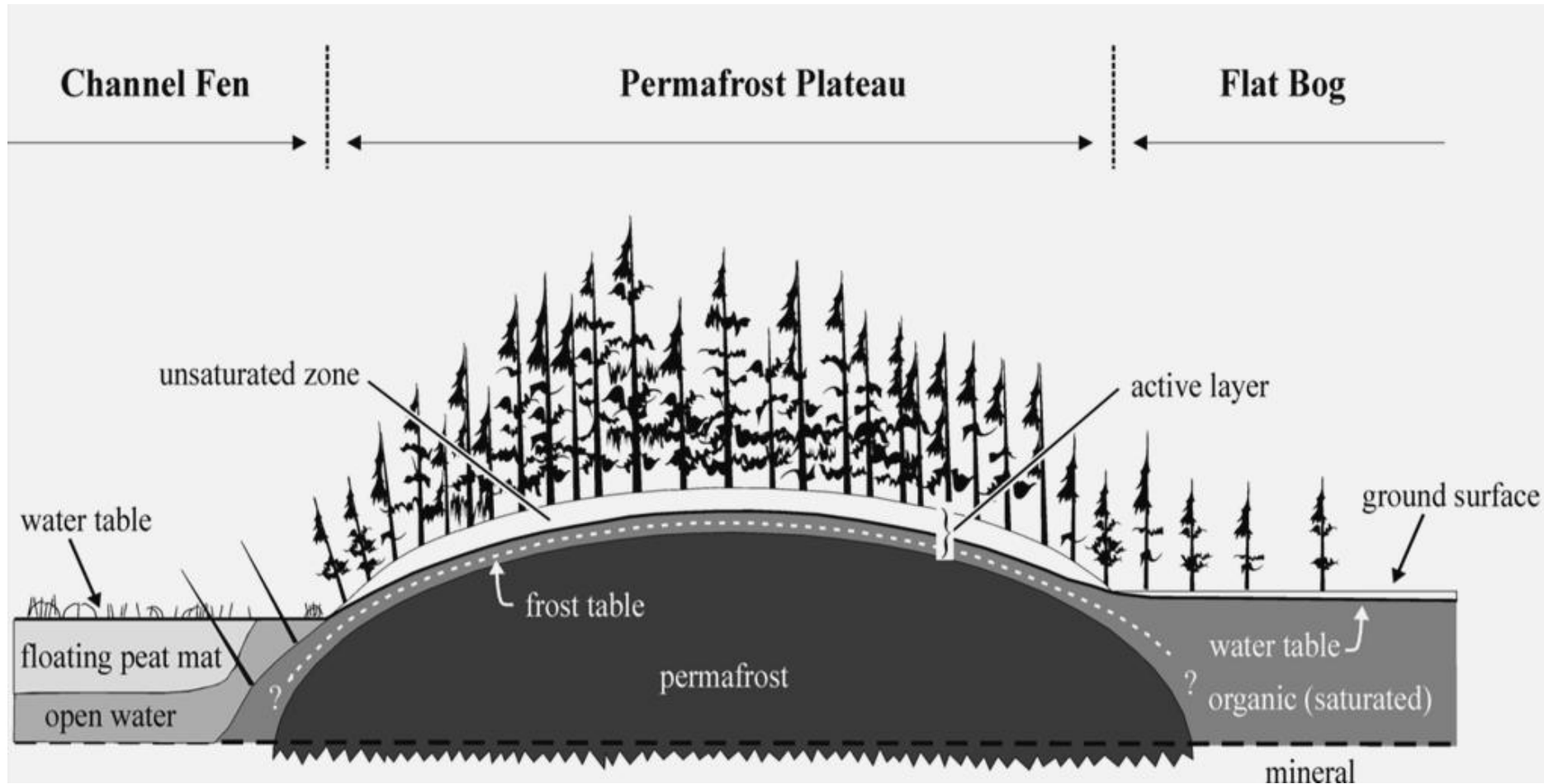


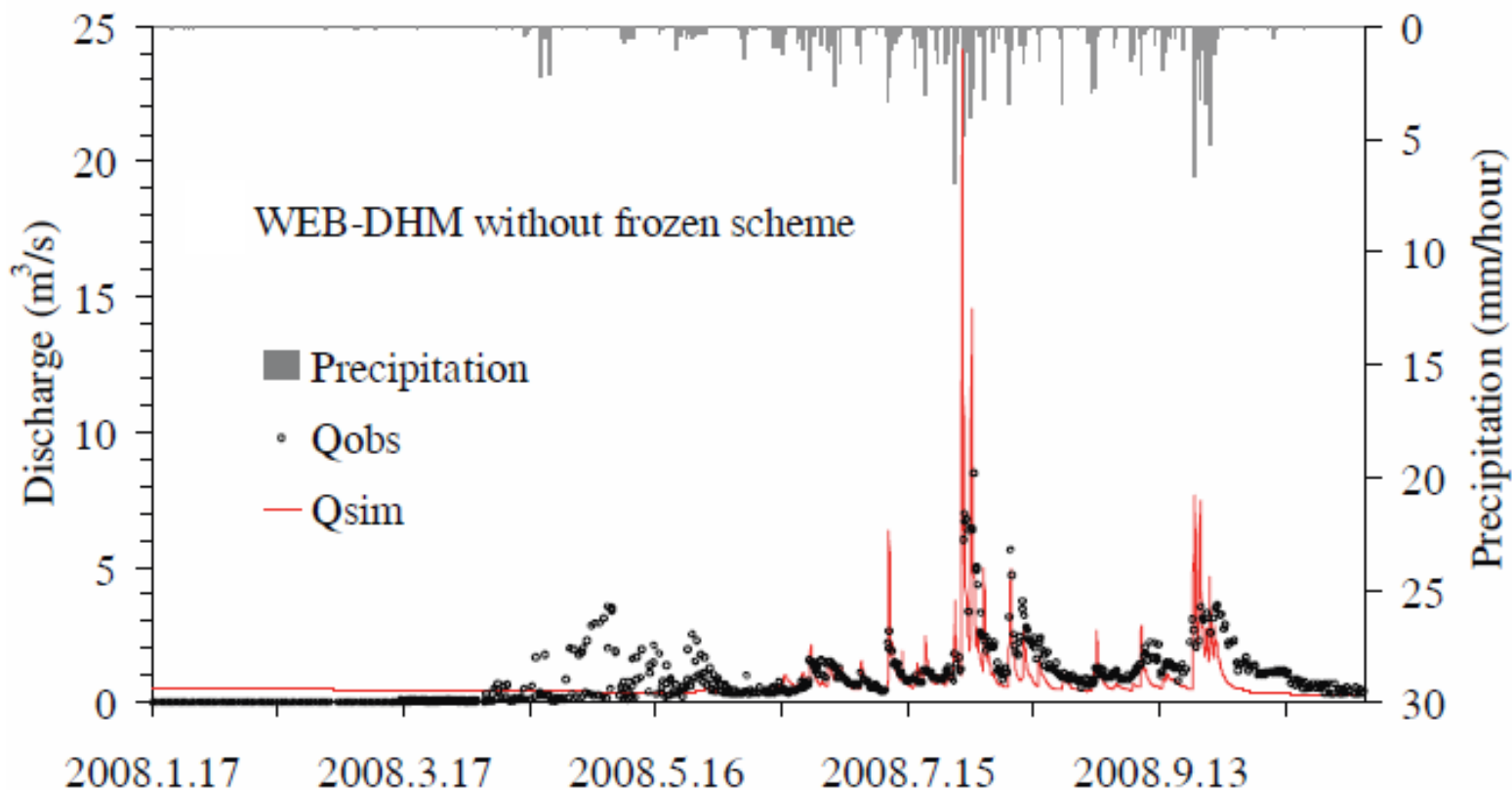




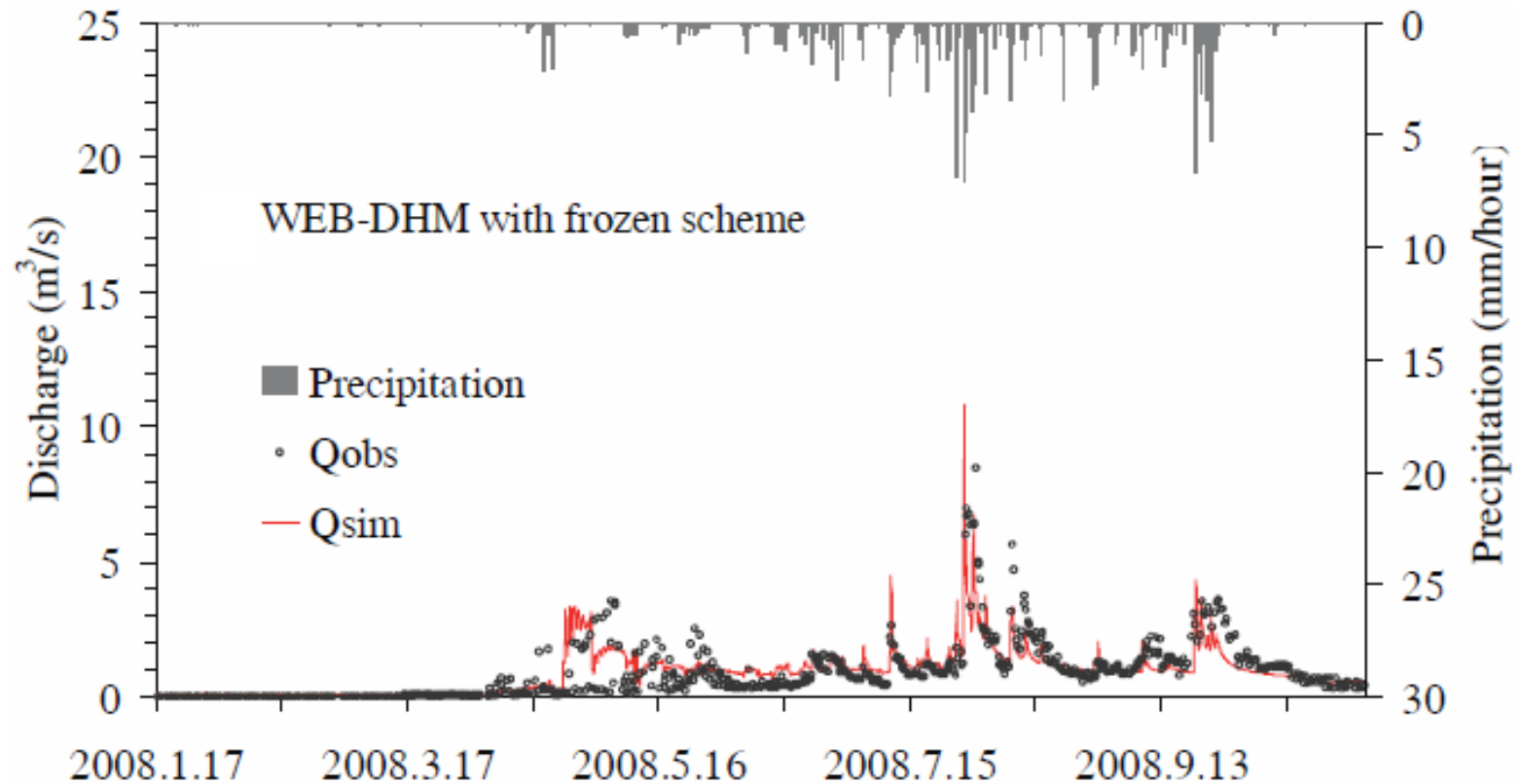
TYPICAL WETLAND COMPONENTS







Wang et al. (2011)



Wang et al. (2011)

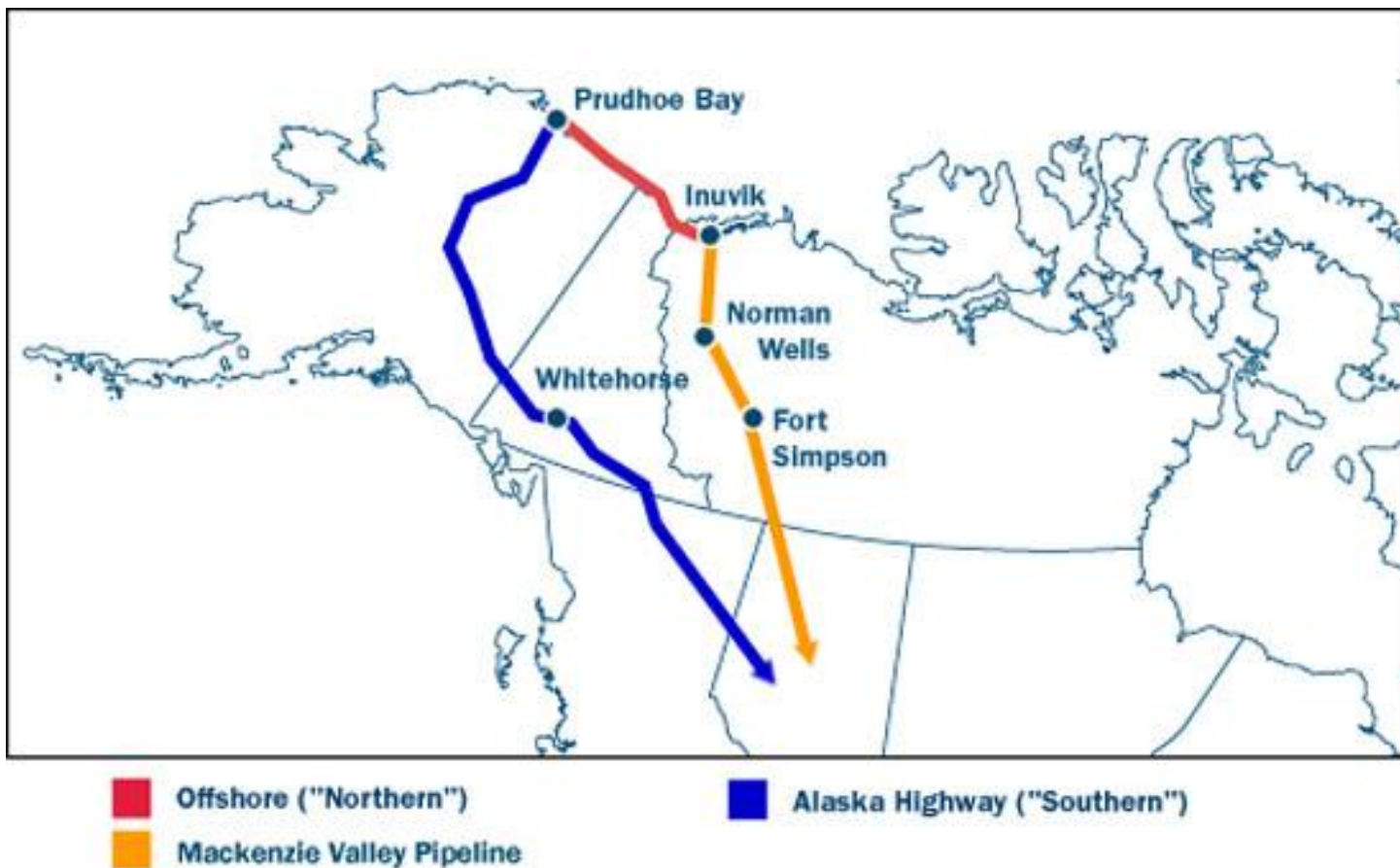


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NORTHERN INFRASTRUCTURE



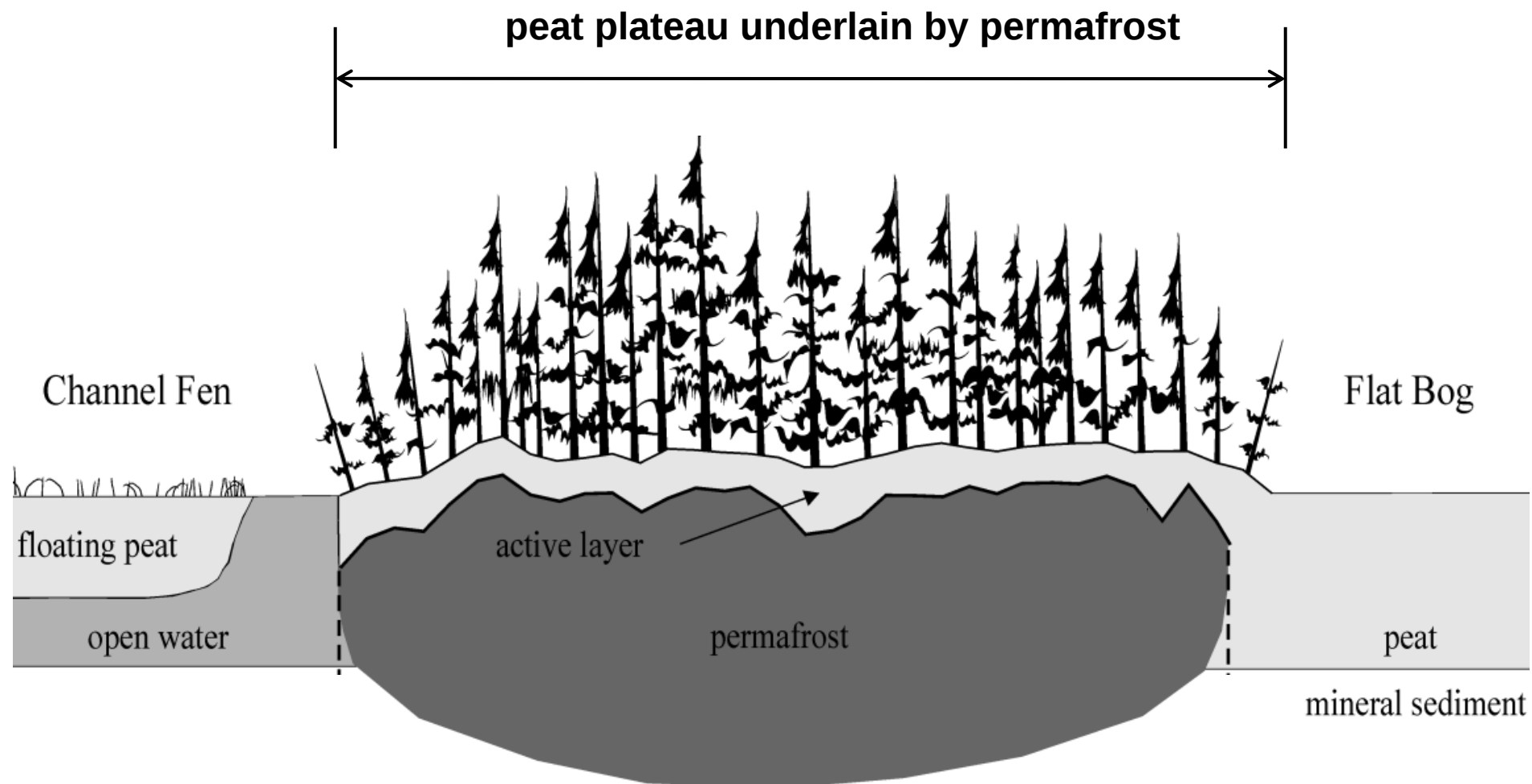
Source: www.wikipedia.com



Source: www.arcticgaspipeline.com



PERMAFROST TOPOGRAPHY





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CLIMATE CHANGE



"HOW ON EARTH DO WE TURN IT OFF?"



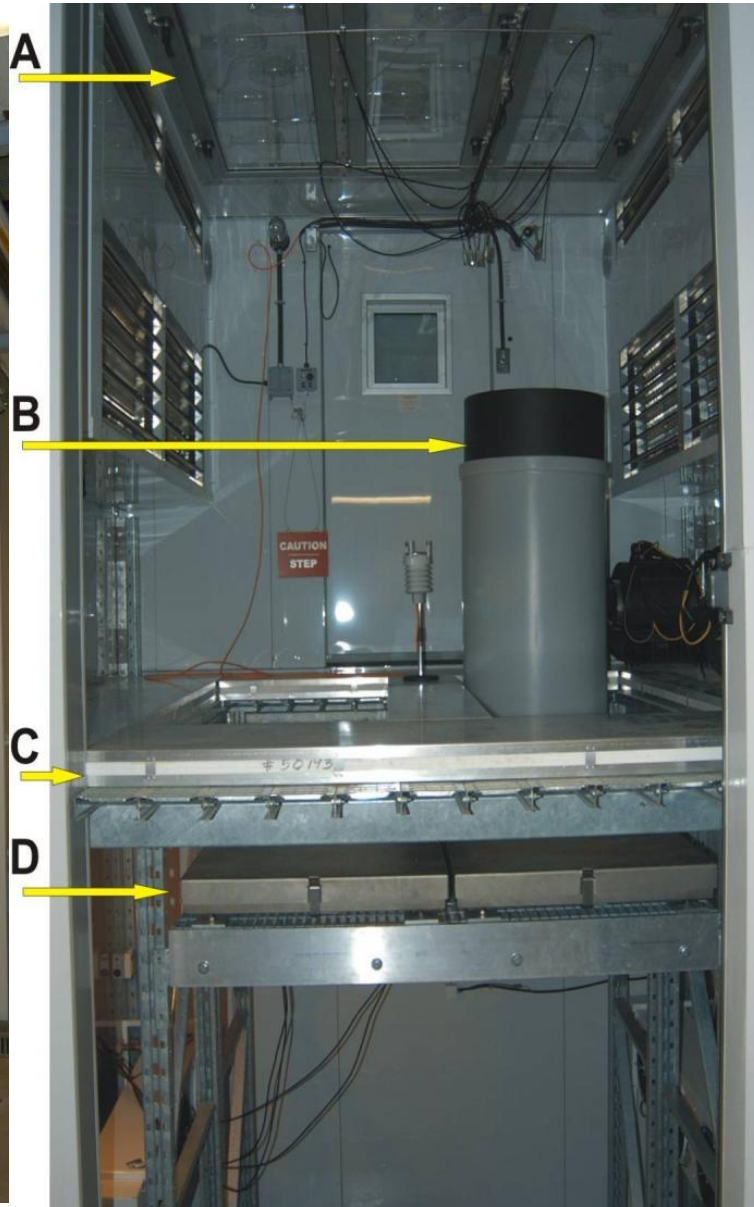
- ▶ **Close coupling of heat and water movement in soils**
- ▶ **Critical to link field studies with laboratory studies (Scotty Creek - 12 years of data)**
- ▶ **Complexities of field conditions limit understanding of impact of individual parameters**
- ▶ **Fundamental work in controlled laboratory settings**



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LABORATORY FACILITY





- ▶ **Establishing 1D profiles is challenging**
- ▶ **Freezing-thaw studies add more complexities**
- ▶ **Radial temperature distribution is not desirable**



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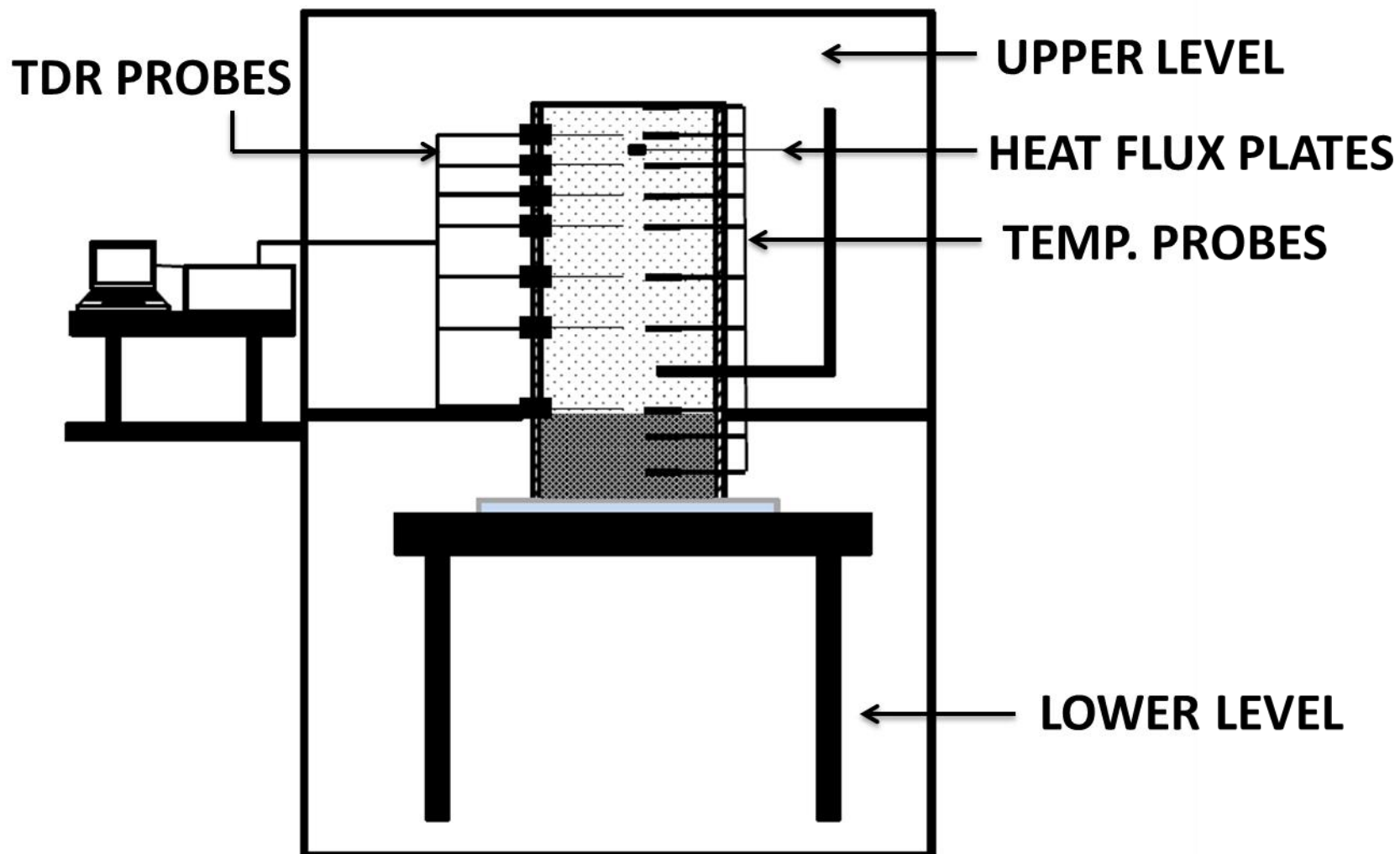
FIELD SAMPLING





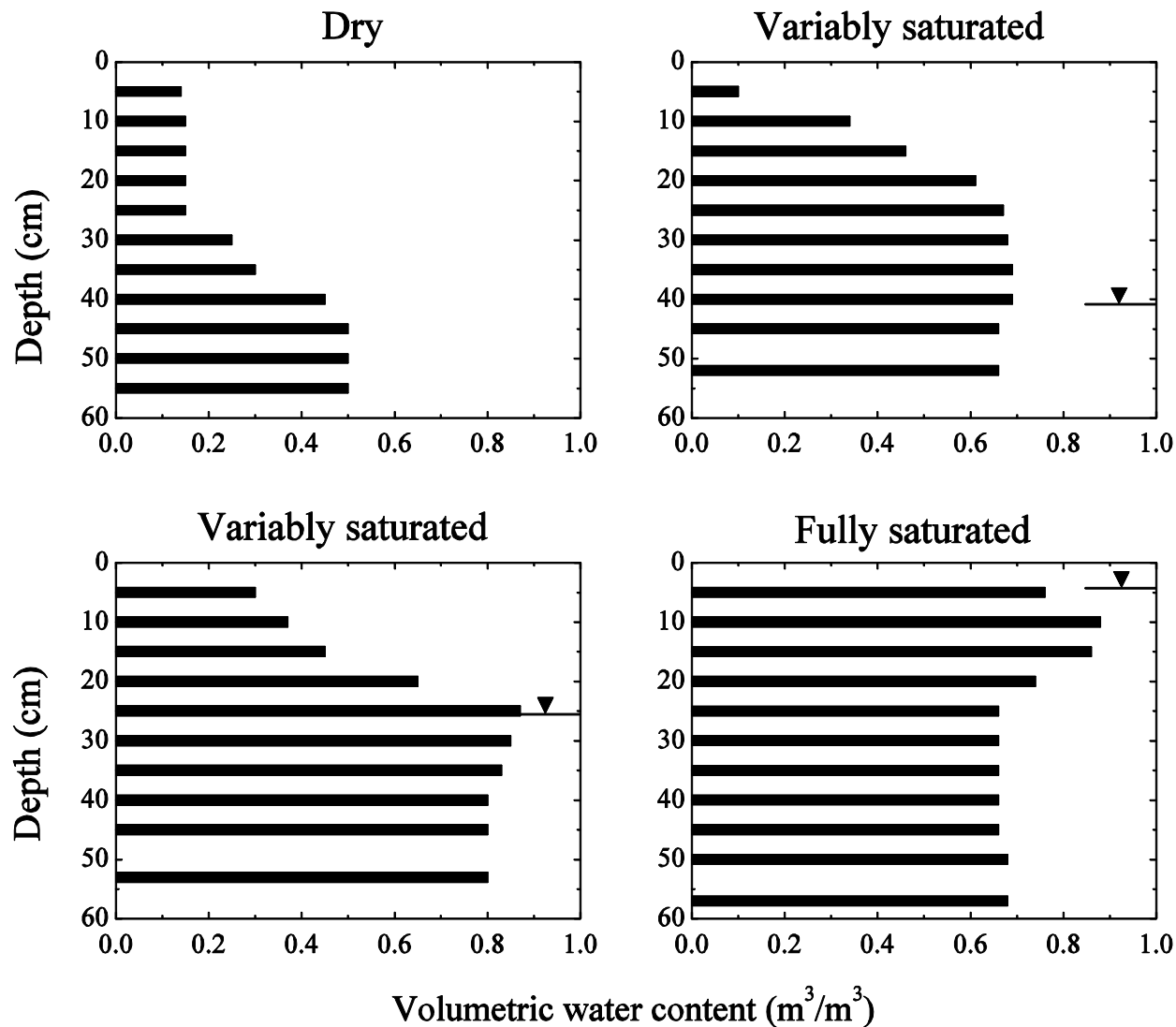
**29 TDR probes for soil moisture measurements,
equal number of temperature probes and
sampling ports and 2 heat flux plates**





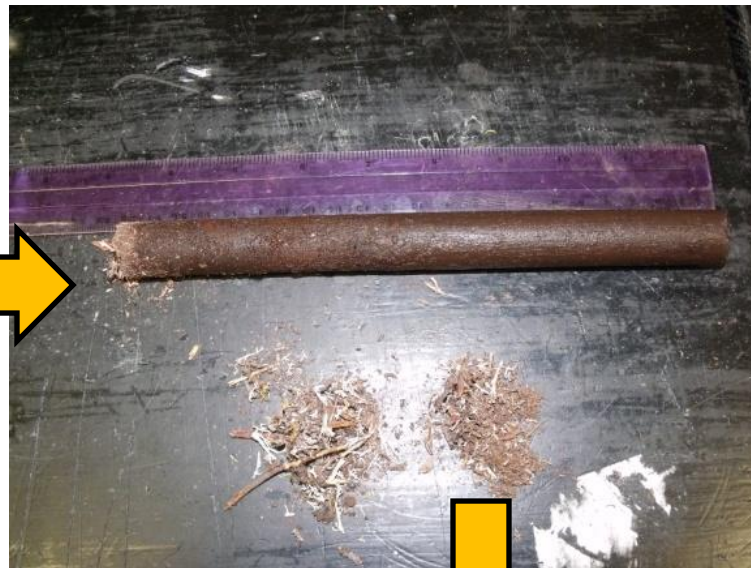


INITIAL MOISTURE CONDITIONS



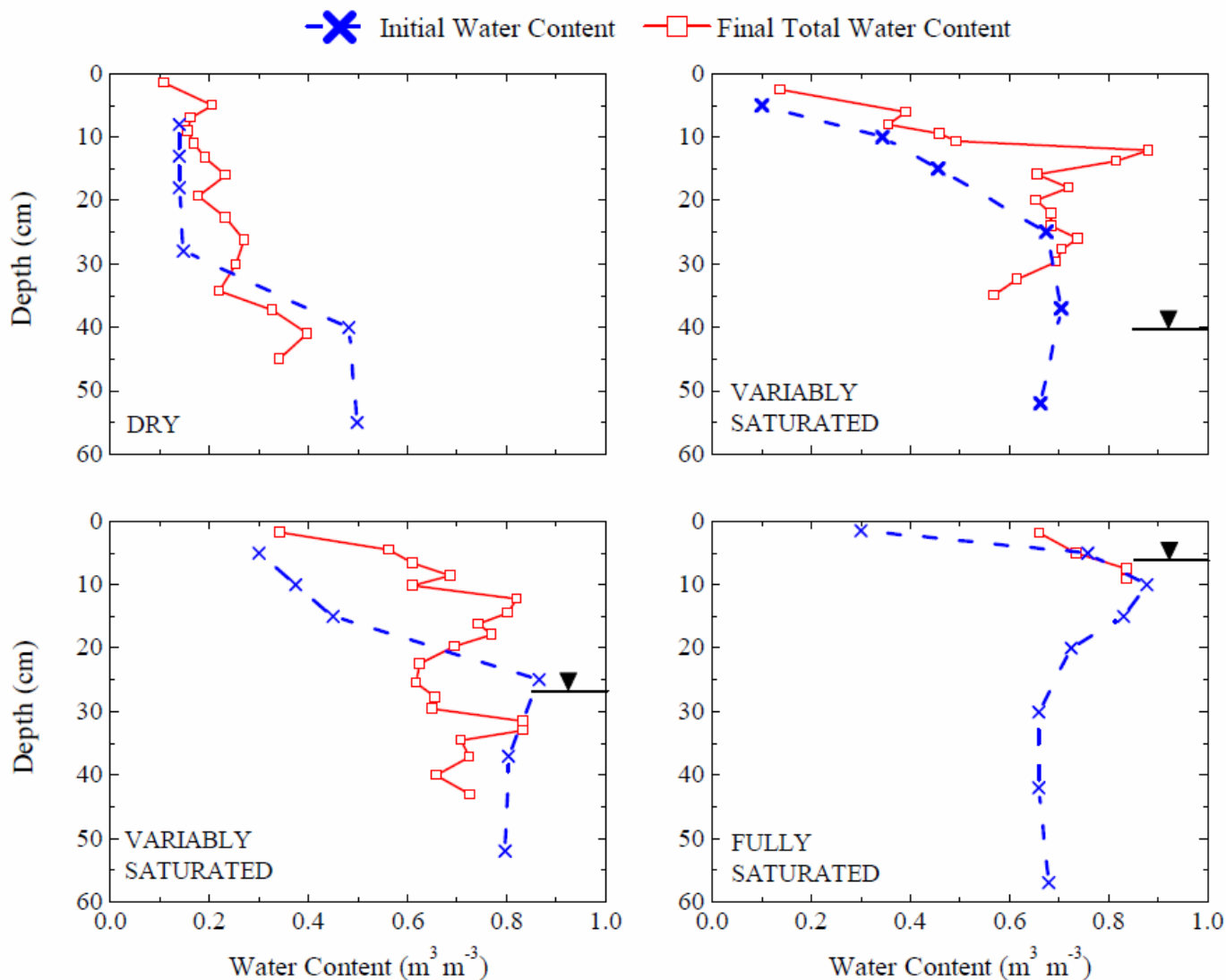


FINAL WATER CONTENTS



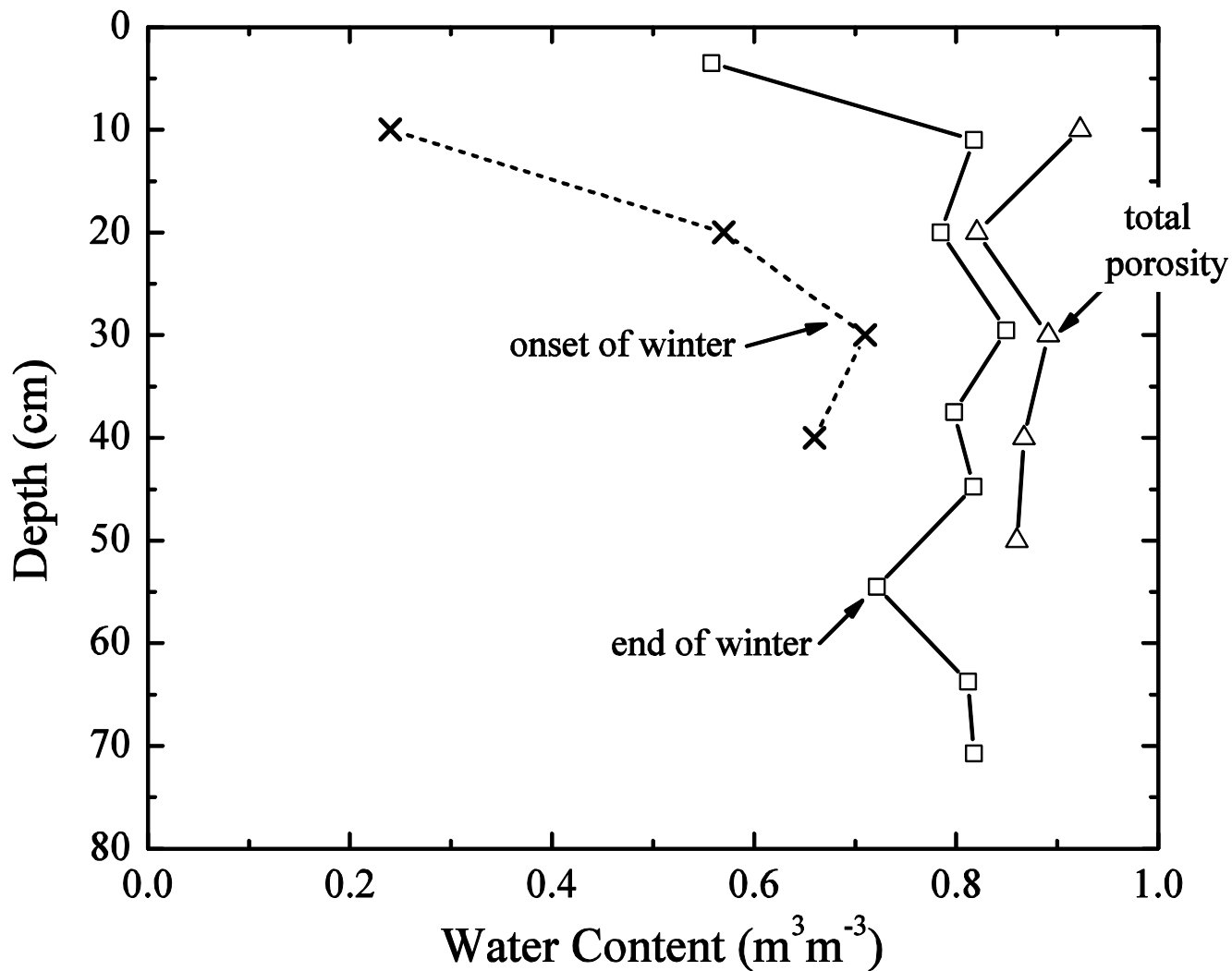


RESULTS: WATER MOVEMENT





DISCUSSION: WATER MOVEMENT





- ▶ **Water Balance Studies**
- ▶ **Frost Table Topography**
- ▶ **Northern Infrastructure**
- ▶ **Climate Change**



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RESEARCH PARTNERS

- ▶ **Dr. Rob Schincariol**
- ▶ **Dr. William L. Quinton**
- ▶ **Dr. Masaki Hayashi**



LAURIER





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NSERC
CRSNG



CFCAS



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QUESTIONS?

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