Cold Regions Research Centre

# CRHM for small scales: wetlands with permafrost

IP3 Users/Stakeholders Community Workshop, 18-19 March 2008, Canmore, Alberta

Wilfrid Laurier University

IP3

Improved Processes & Parameterisation
for Prediction in Cold Regions

Subsurface drainage:

Inuvik

Whitehorse

Fort Simpson

$$\log K(z) = \frac{\log K_{btm} + (\log K_{top} - \log K_{btm})}{[1 + (z/z_{trn})^n]}$$

depth below ground surface (m)

high flow

frost table

low flow

Measured

Hydraulic conductivity m/d

University
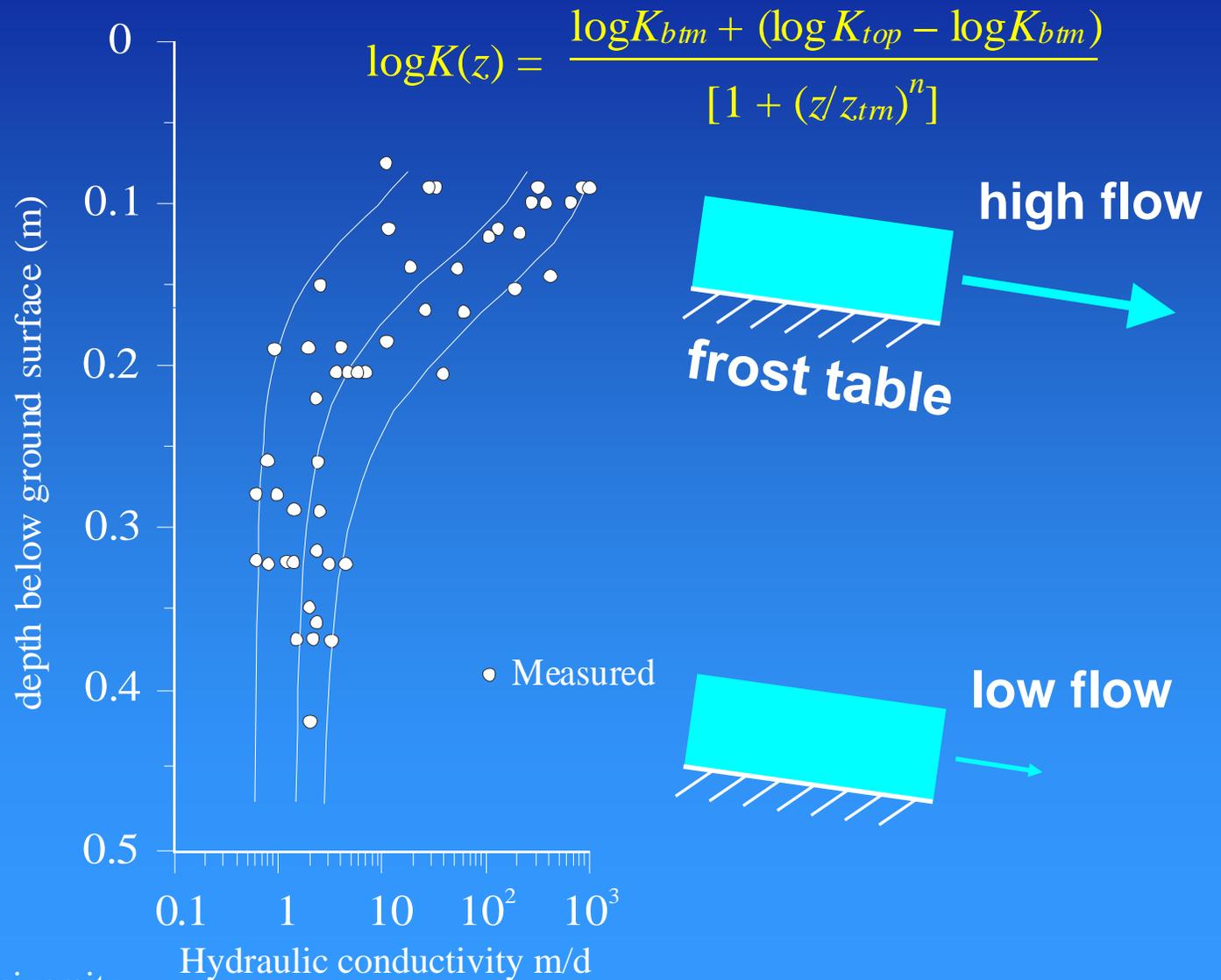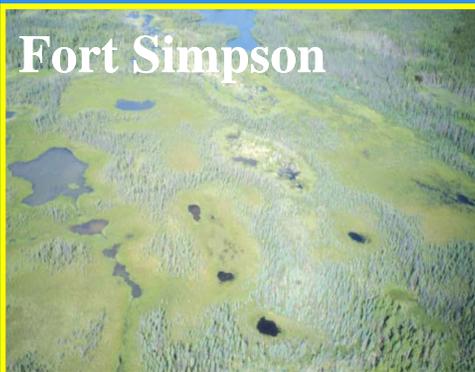
Cold Regions Hydrological Model:
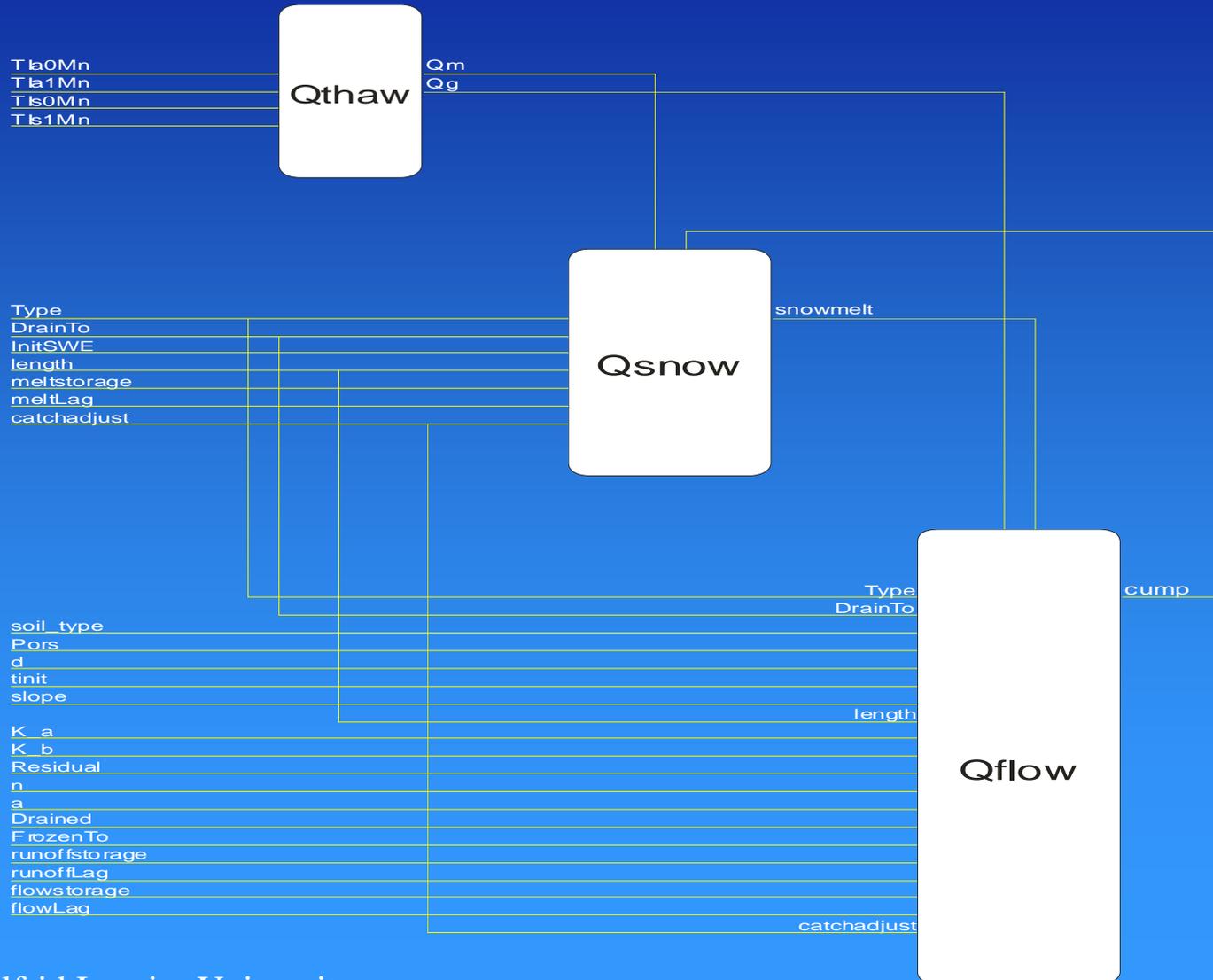
Model Description:
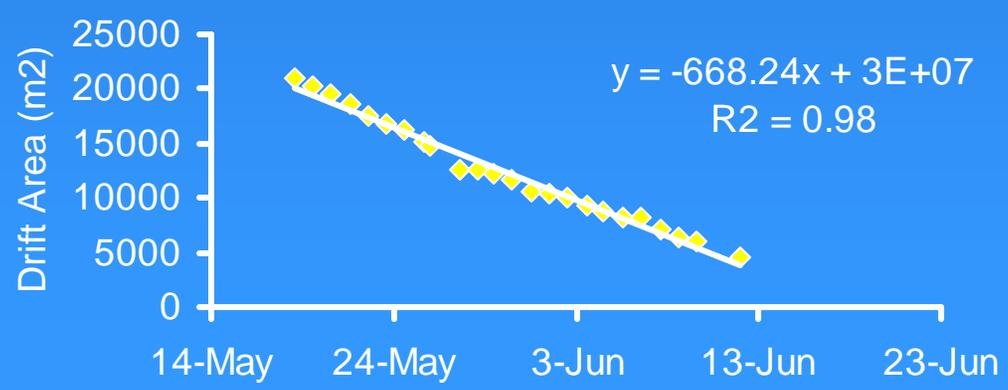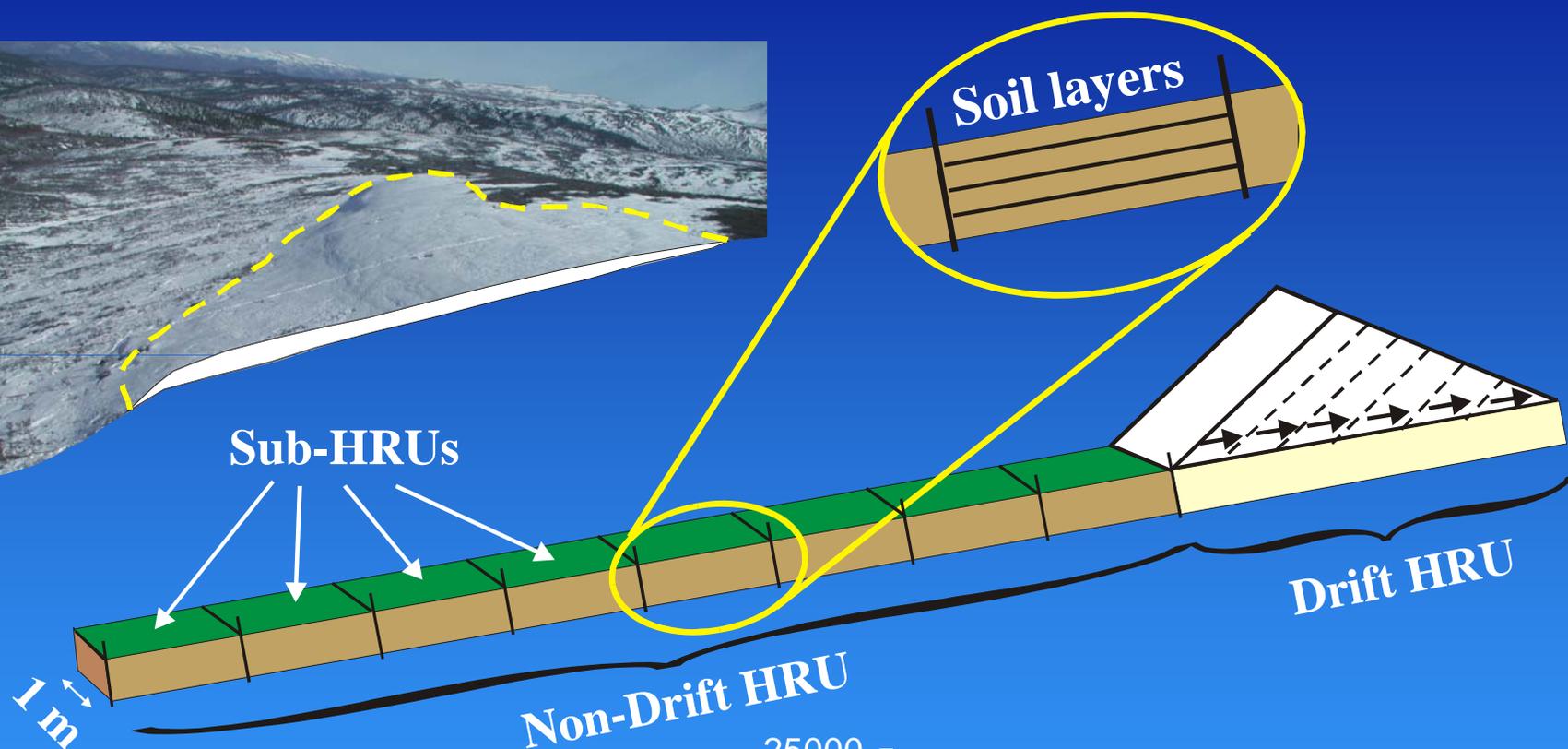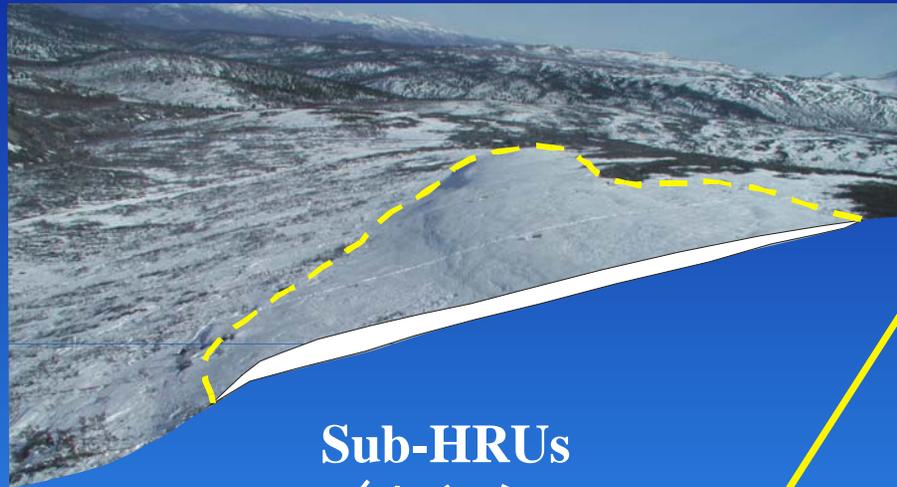
# SSF from all HRUs, Layers:
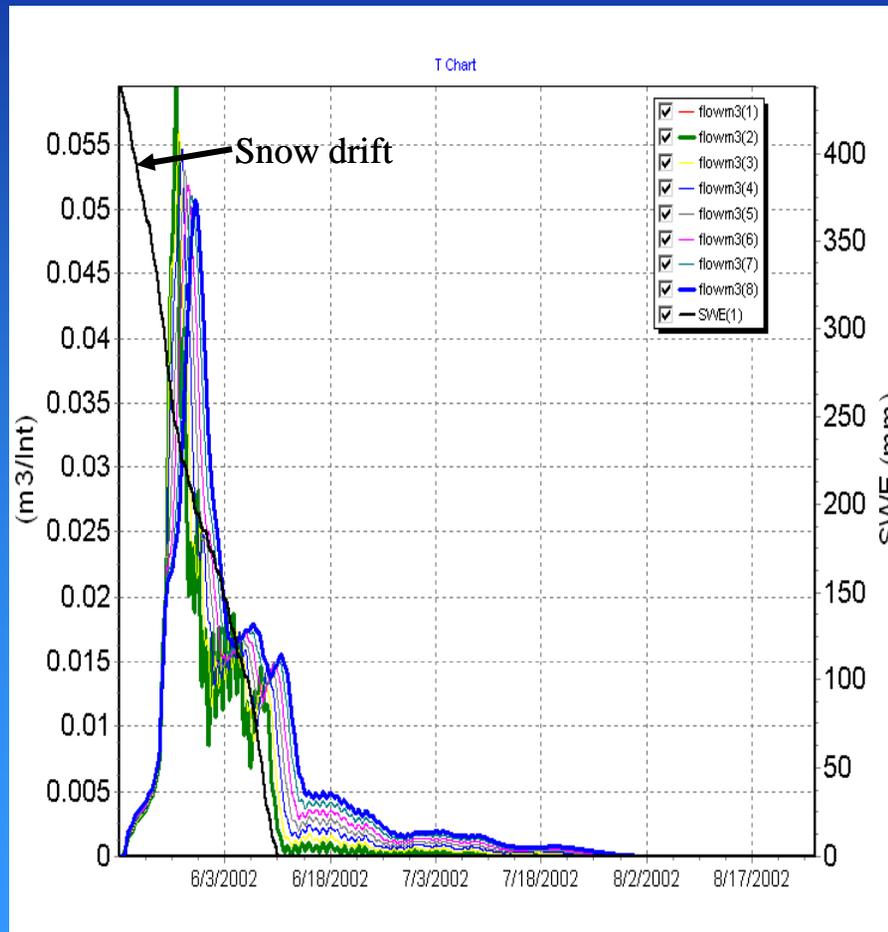
Snow drift only: Snow drift and rainfall:

Hillslope Runoff:

unsaturated zone

active layer

water table

frost table

floating peat mat

open water

permafrost

organic (saturated)

mineral
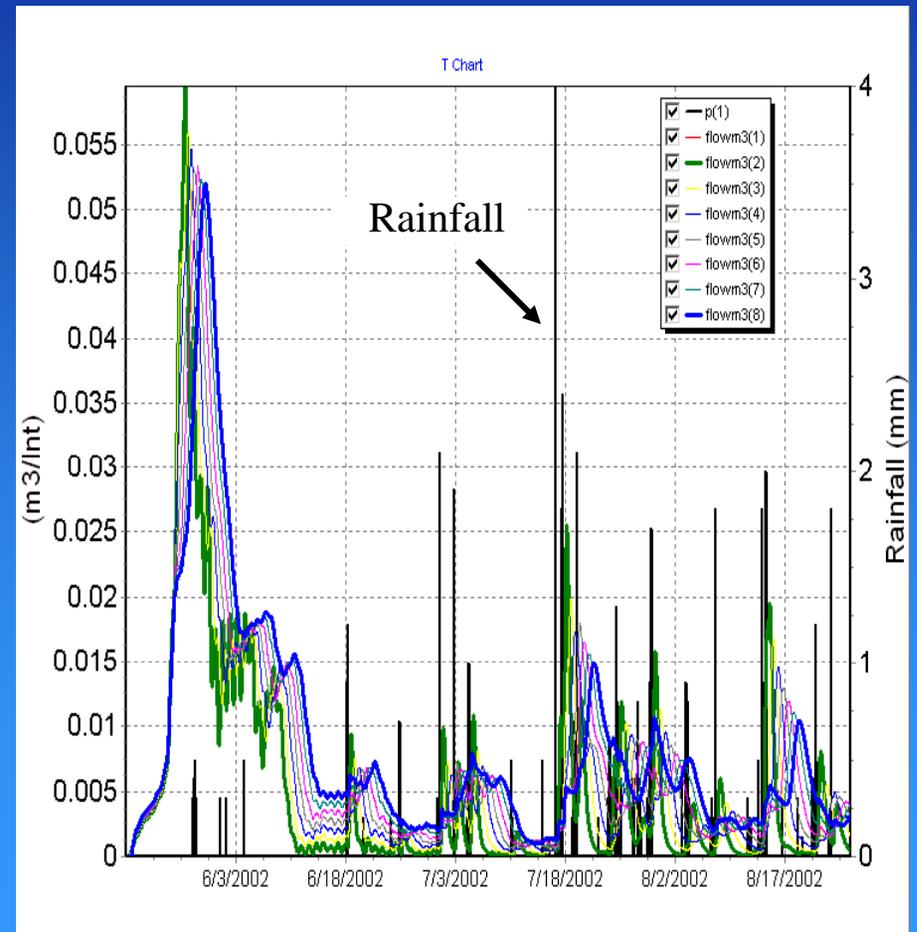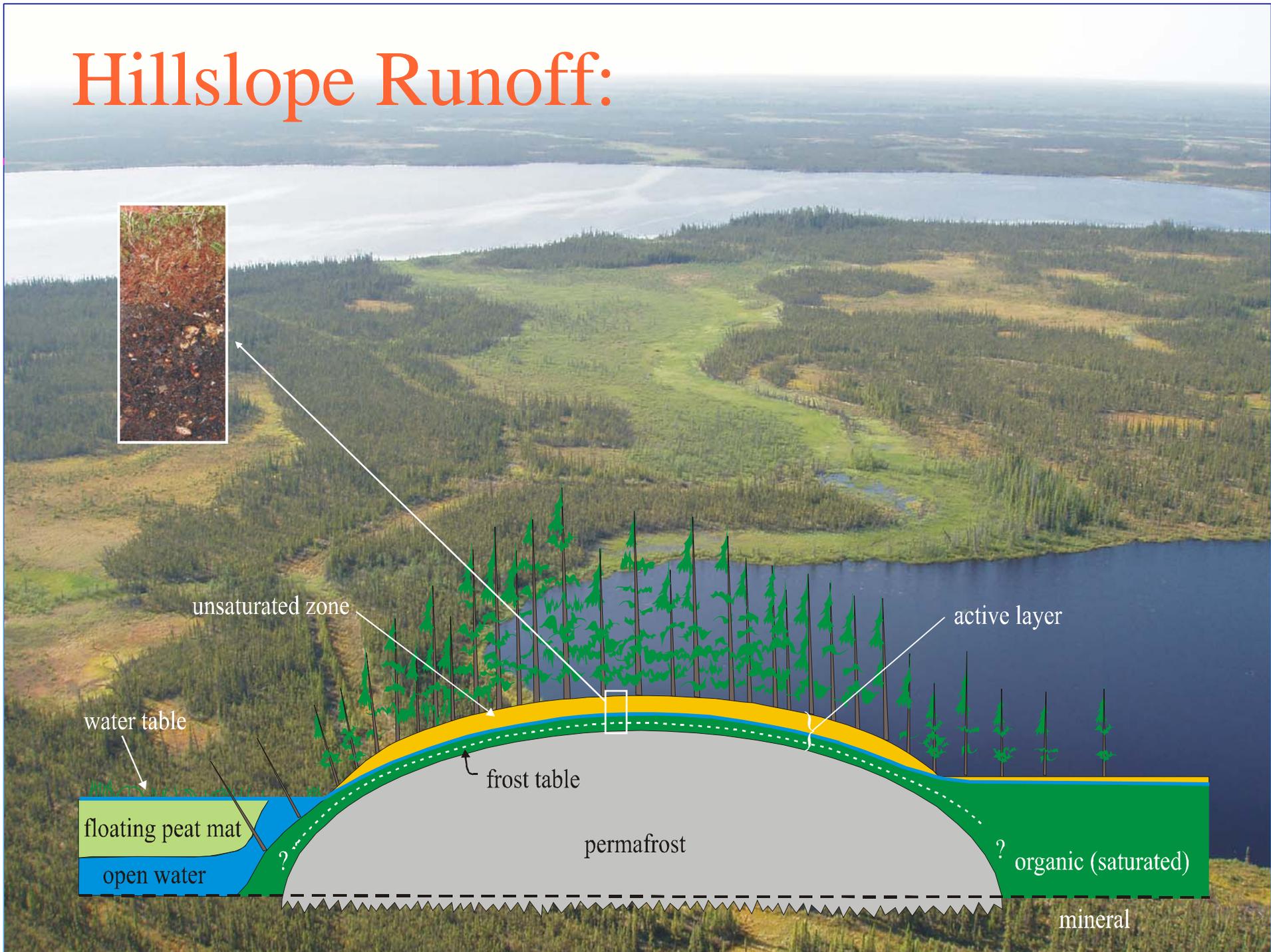
Extending CRHM to basins:

1 m
HRU 1 (snow)
HRU 2 (soil)

melt water percolation

subsurface drainage
from HRU 2 to fen

soil layers

Water table

Frost table

1 m

Peat plateau runoff (CRHM)

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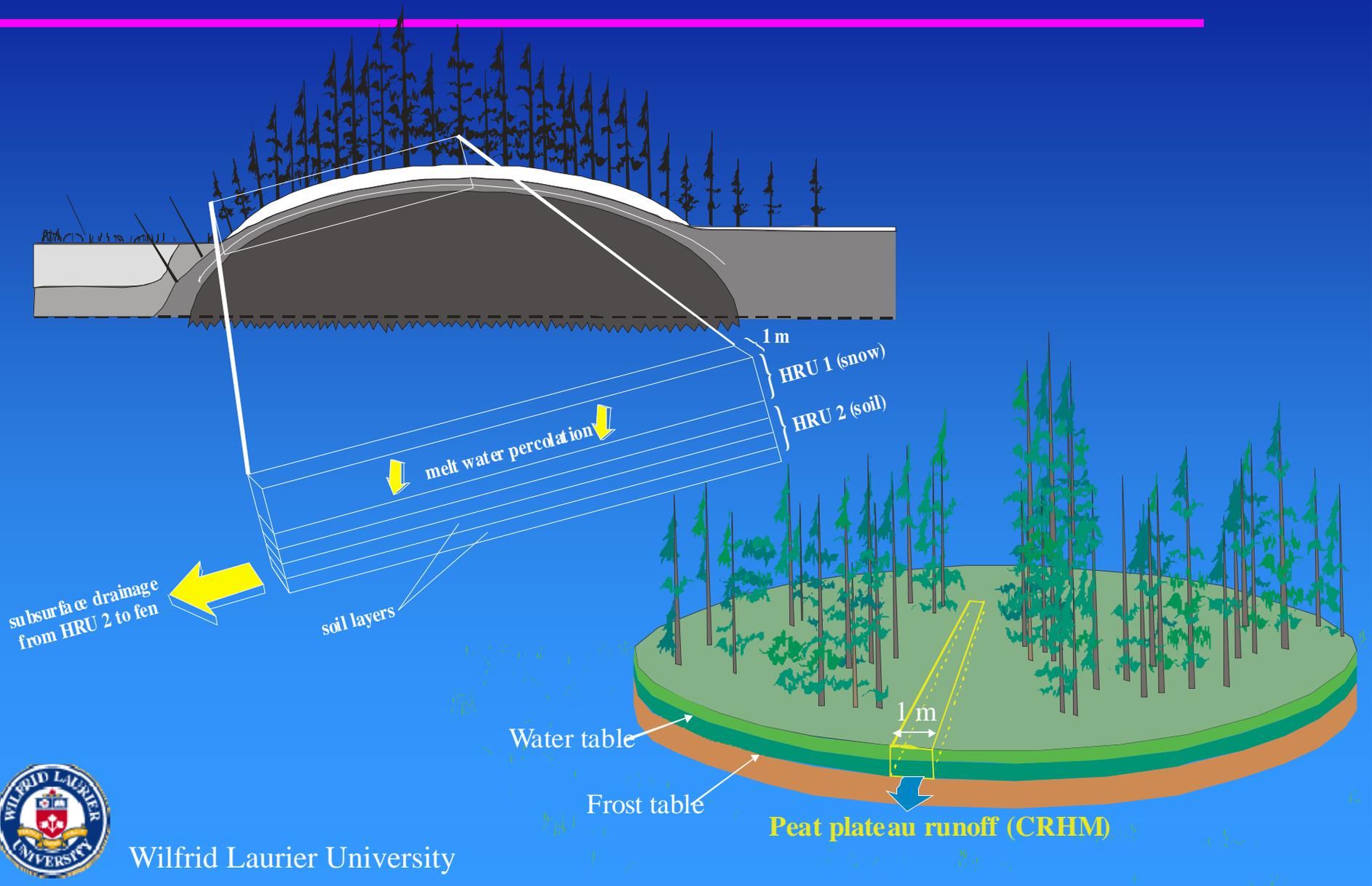
CRHM performance:
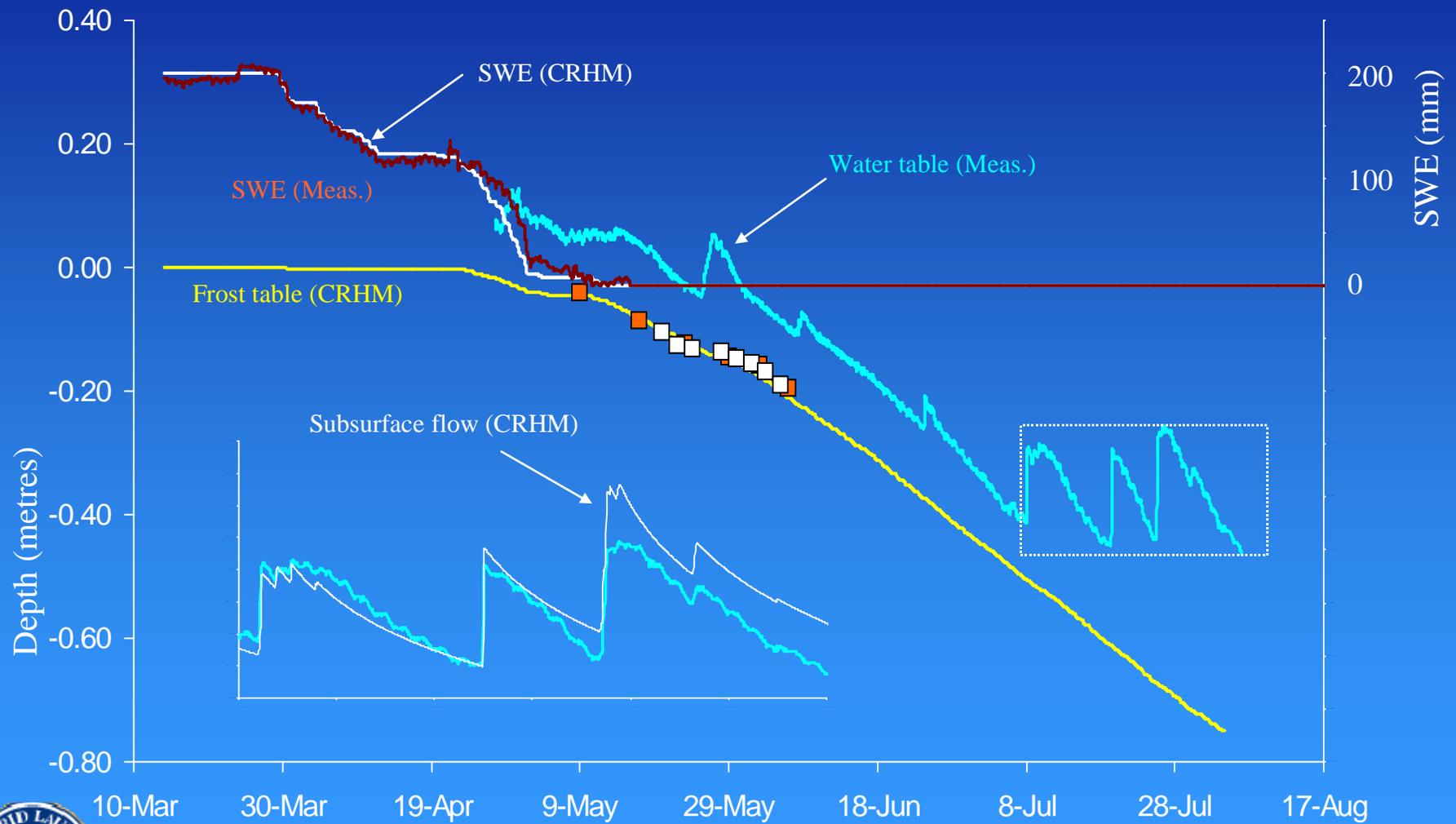
Total (R_o + Et) water loss:
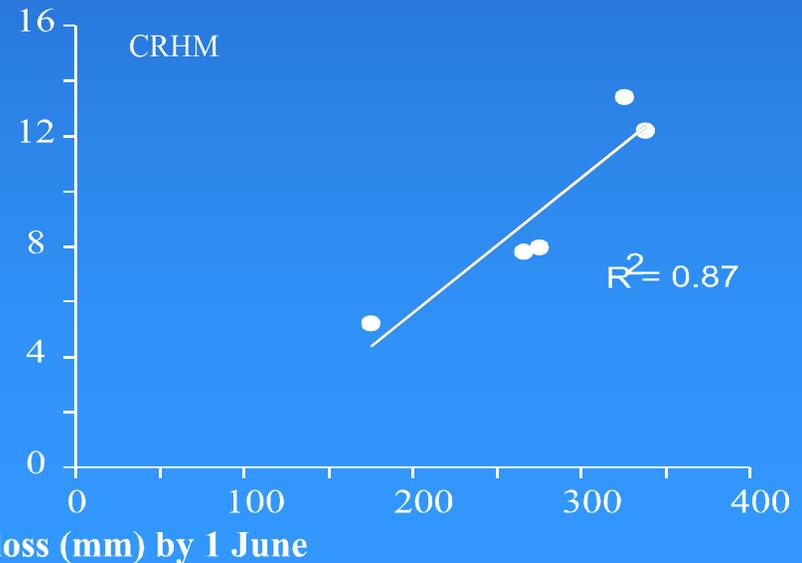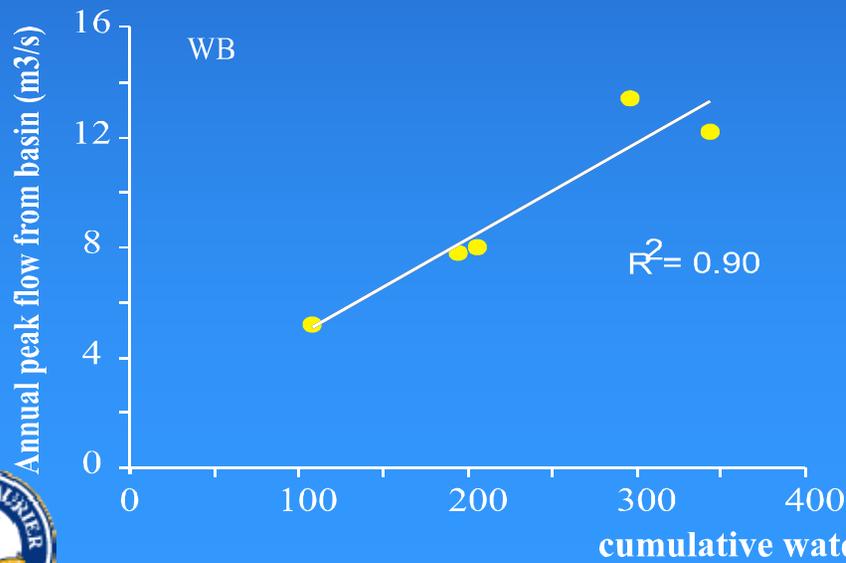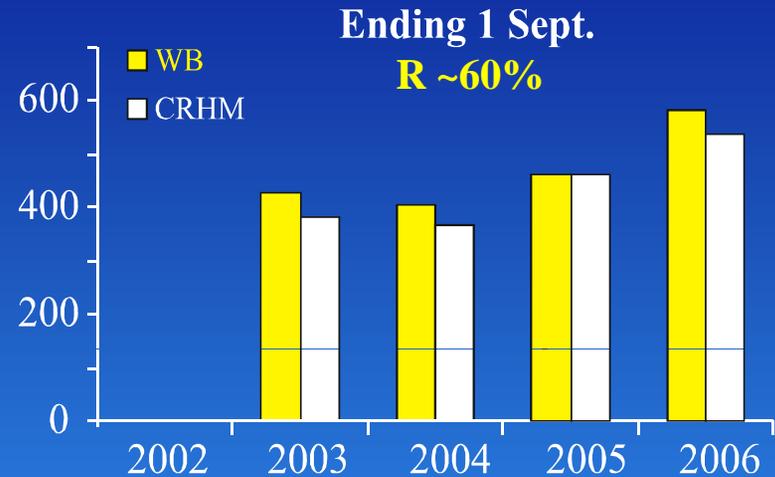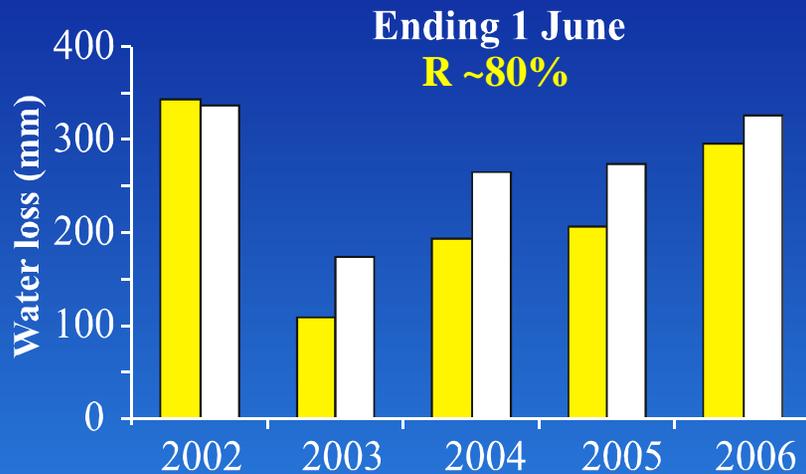
Next steps – routing through fens:

1 km
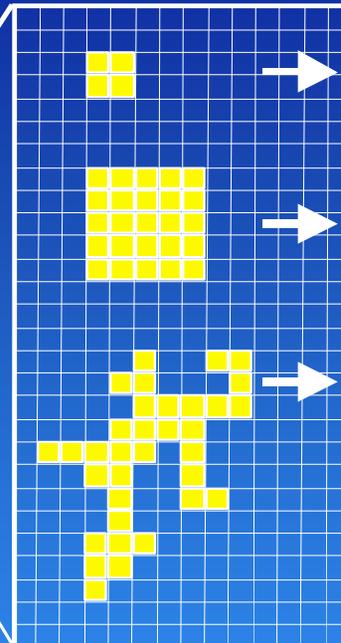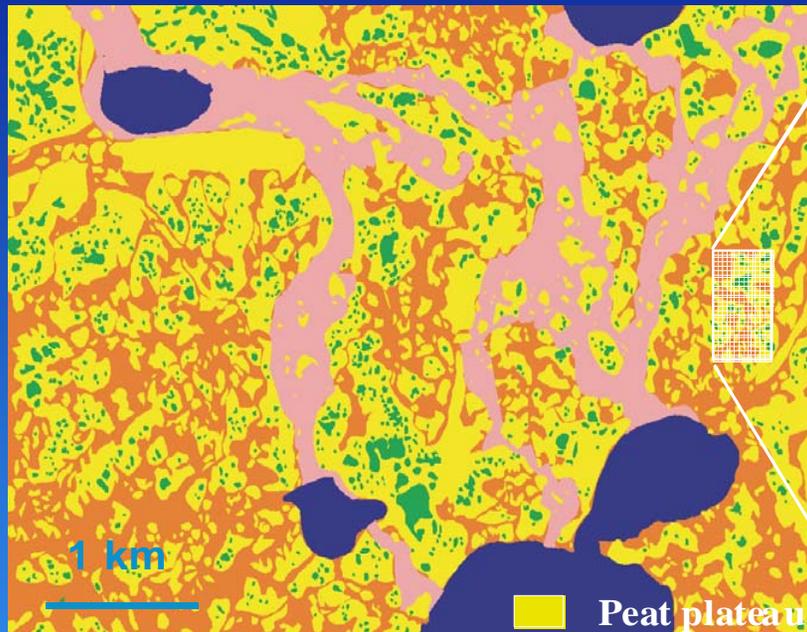
Peat plateau

$L = 2\ A/P$
$L = 1\ m$

$L = 2\ A/P$
$L = 2.5\ m$

$L = c\ A/P$
$c = 1 - 2$
$L = 0.56 - 1.11\ m$
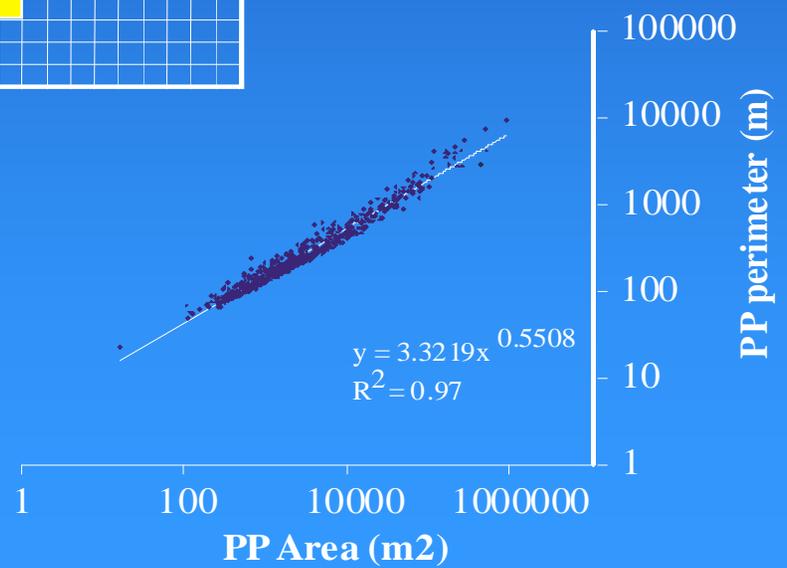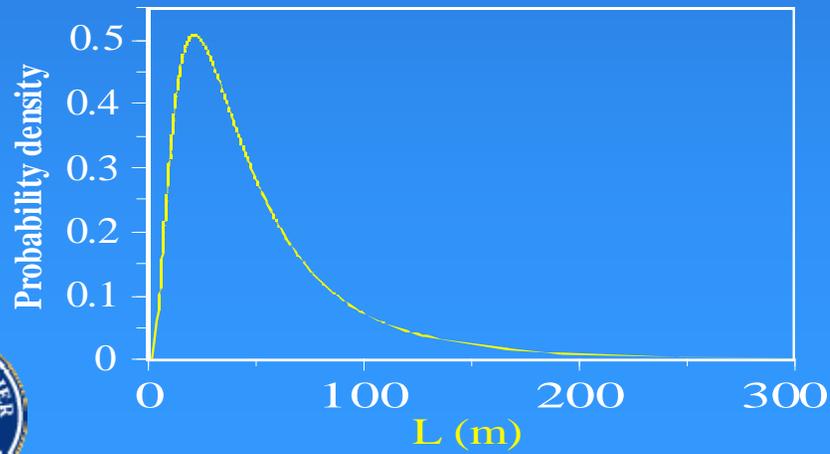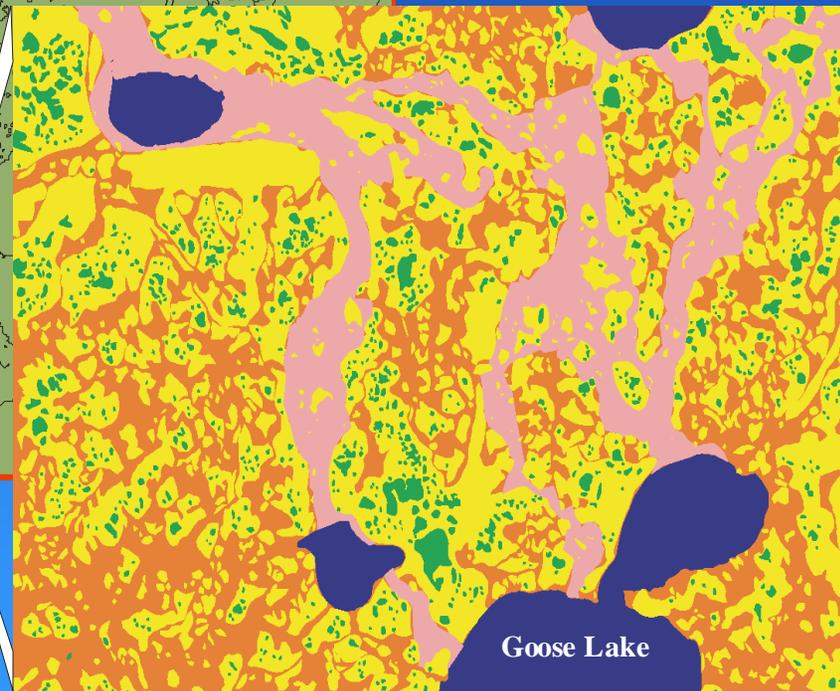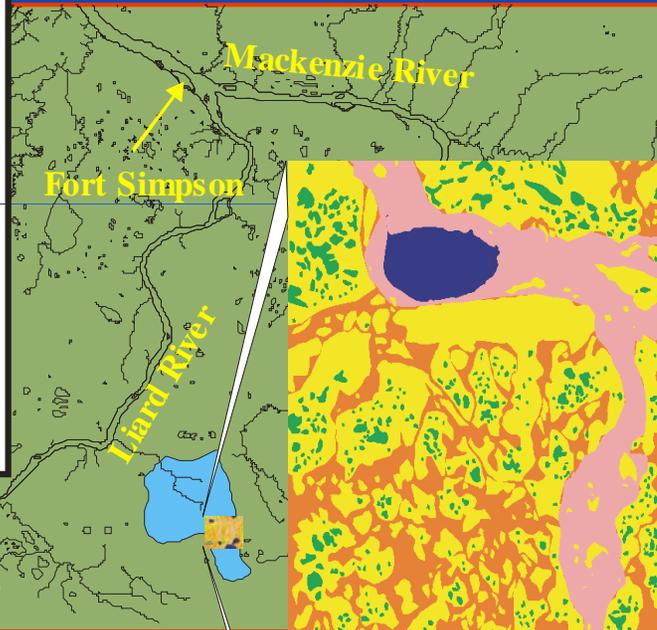
Probability density

L (m)

PP perimeter (m)

PP Area (m2)

$y = 3.3219x^{0.5508}$
$R^2 = 0.97$

Scotty Creek, NWT, Canada:

Legend:
- Lake
- Isolated bog
- Fen
- Connected bog
- Peat plateau

Running CRHM

Select
Modules

Define
Parameters

#HRU (20) / #layers

1) Basin ⟶ **HRU type, length, drainage direction**

2) Drift ⟶ **SWE, lag, storage**

3) Melt ⟶ **Melt coefficients**

4) Runoff ⟶ **For each layer: thicknesses, porosity, retention, soil type, initial temp.Lag and storage, slope.**