Soil Moisture Process Controls and Variability At Large Scales

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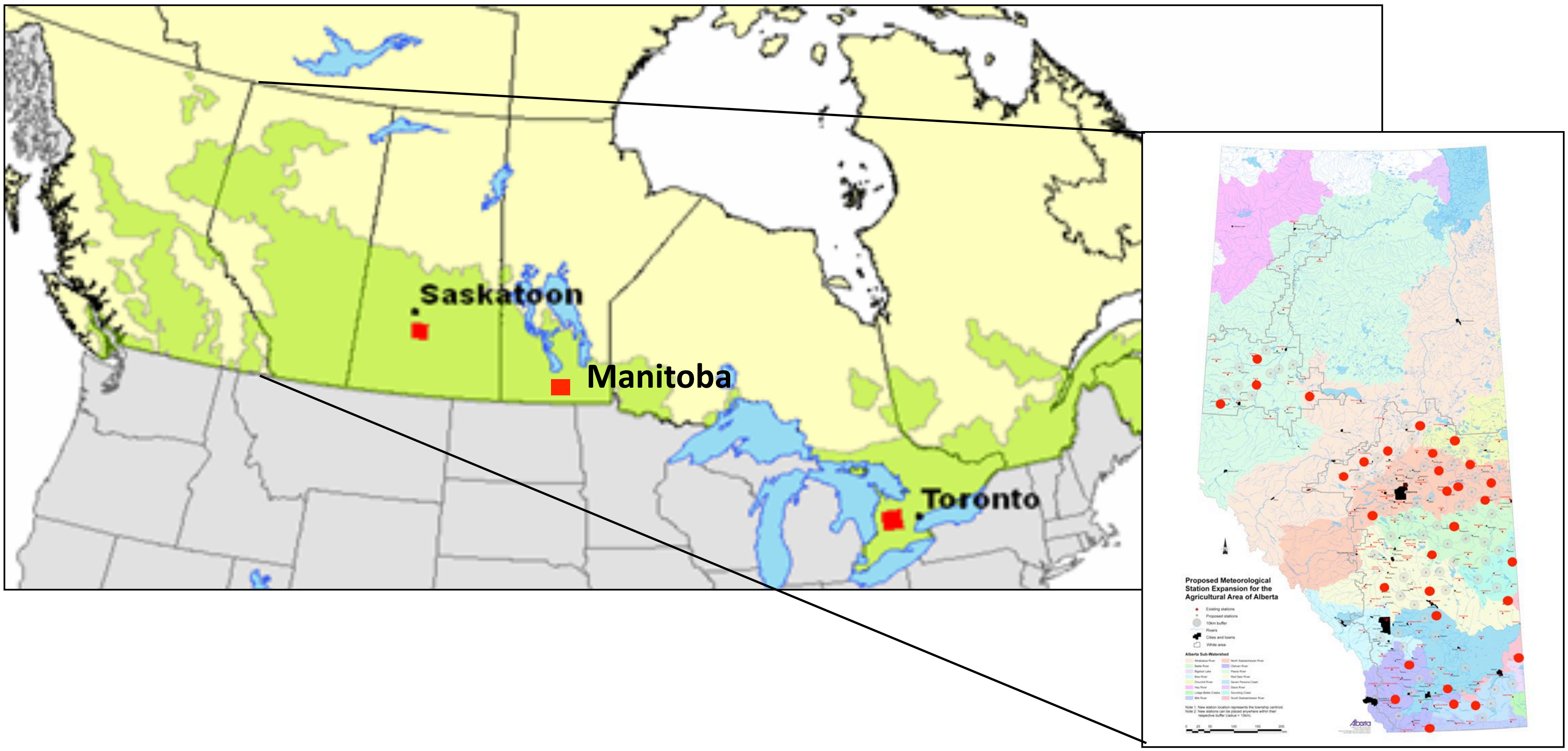
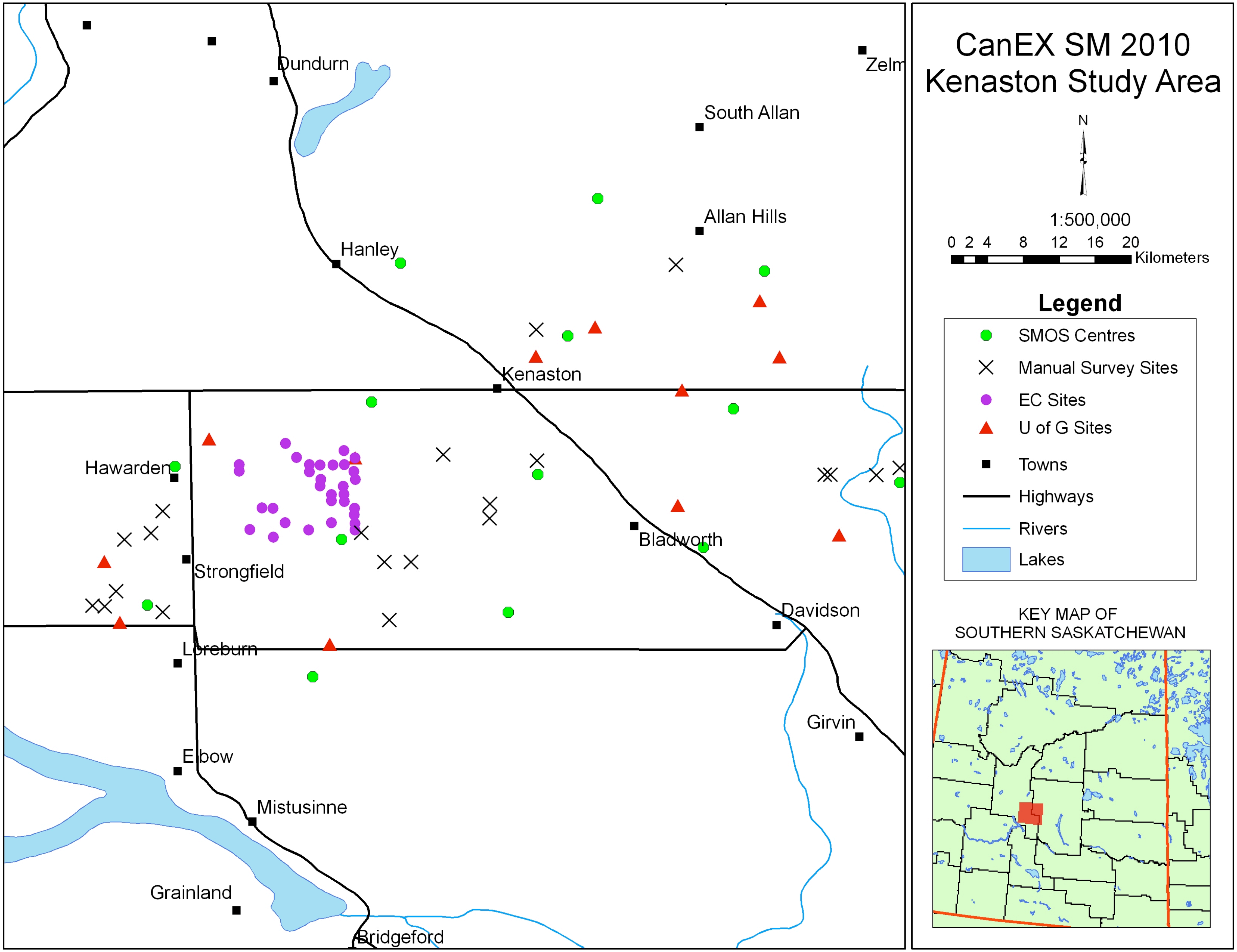
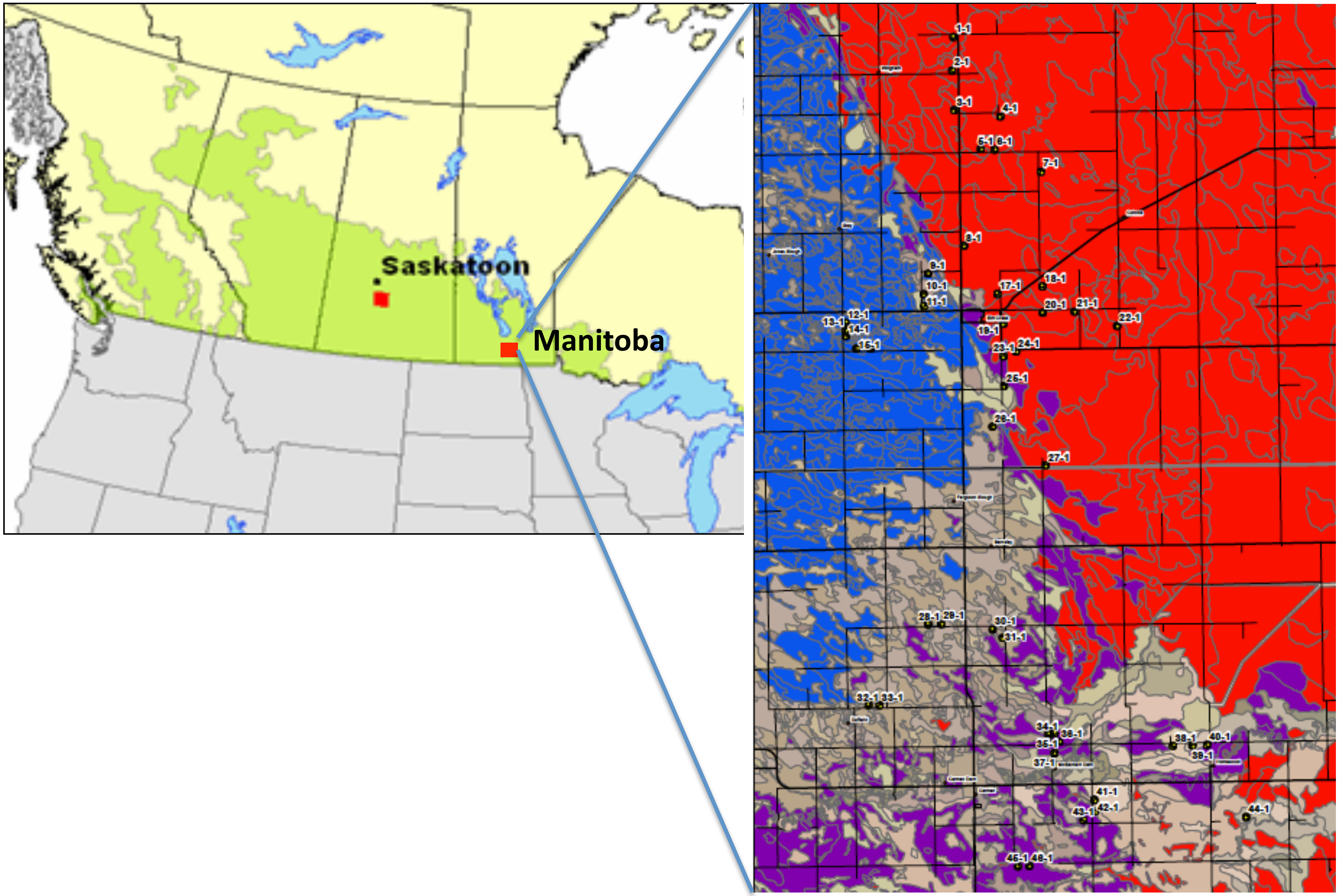
Soil Monitoring Moisture Networks in Canada

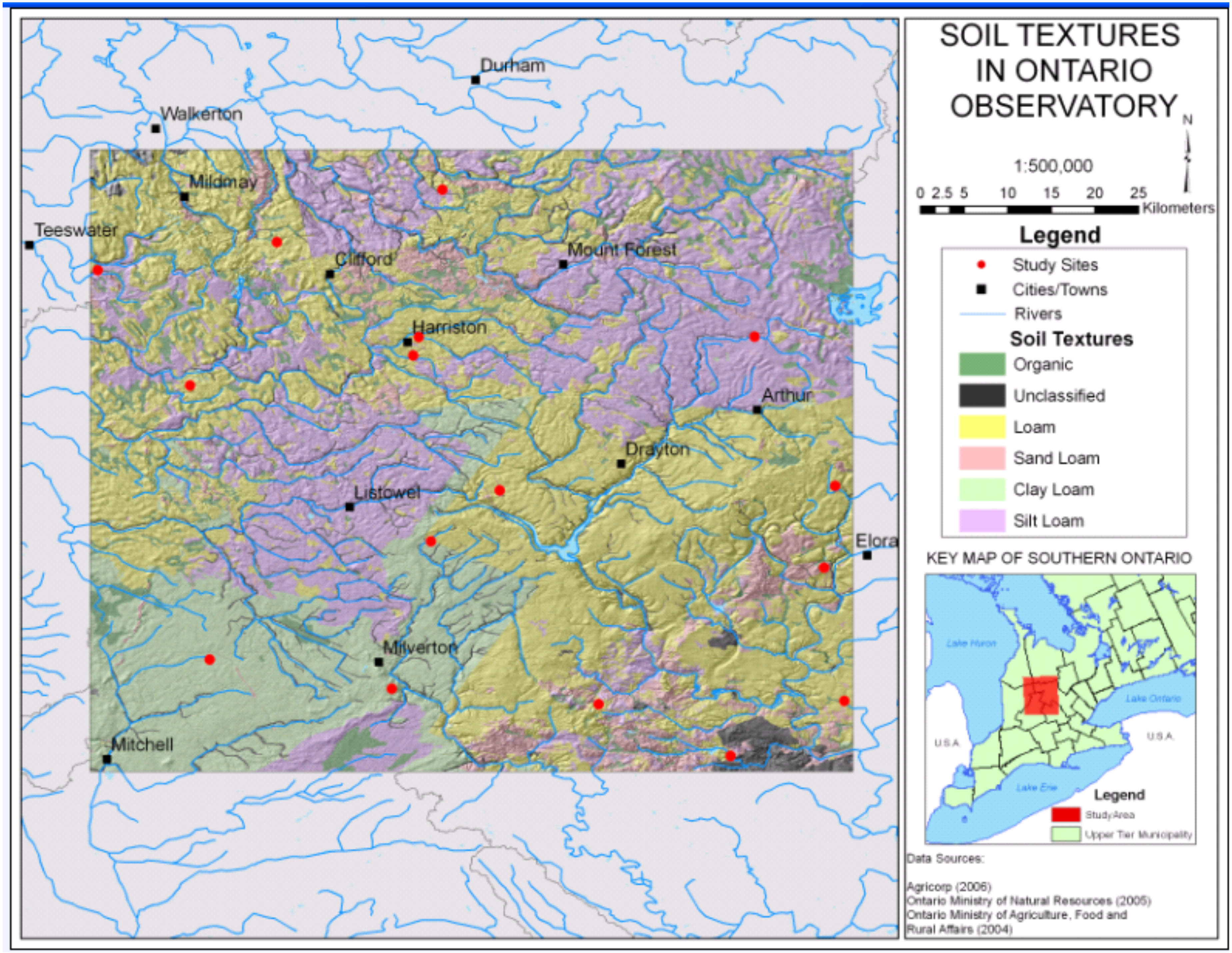




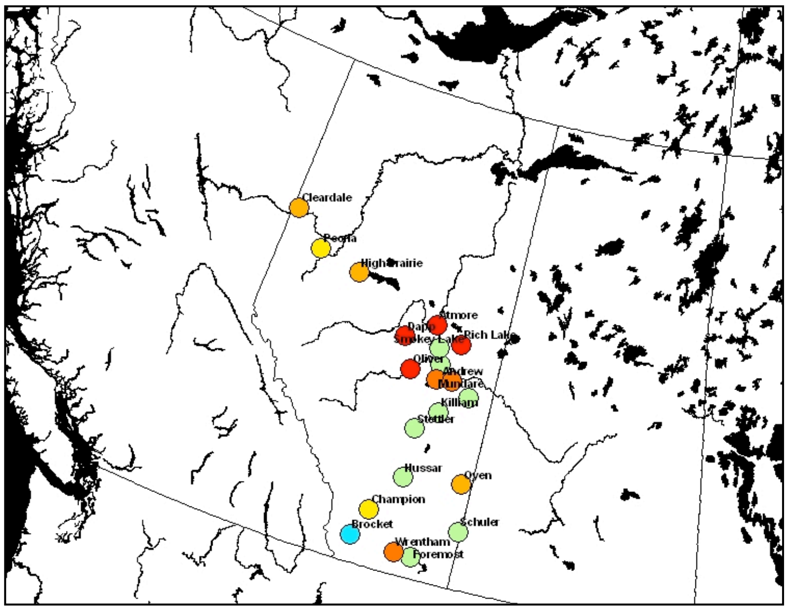
CanEX SM 2010
Kenaston Study Area
N
1:500,000
0 2 4 8 12 16 20
Kilometers
Legend
SMOS Centres
Manual Survey Sites
EC Sites
U of G Sites
Towns
Highways
Rivers
Lakes
KEY MAP OF
SOUTHERN SASKATCHEWAN
Dundurn
Zelm
South Allan
Allan Hills
Hanley
Kenaston
Hawarden
Strongfield
Bladworth
Davidson
Loreburn
Girvin
Elbow
Mistusinne
Grainland
Bridgeford

Soil Monitoring Moisture Networks in Canada

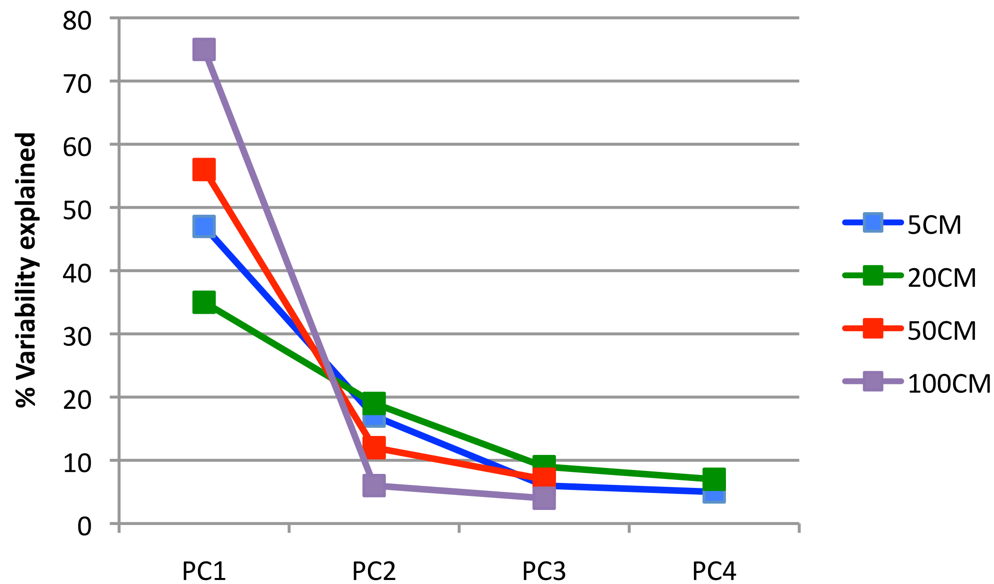



SOIL TEXTURES
IN ONTARIO
OBSERVATORY
N
1:500,000
0 2.5 5 10 15 20 25
Kilometers
Legend
Study Sites
Cities/Towns
Rivers
Soil Textures
Organic
Unclassified
Loam
Sand Loam
Clay Loam
Silt Loam
KEY MAP OF SOUTHERN ONTARIO
Lake Huron
Lake Ontario
Lake Erie
U.S.A.
U.S.A.
Legend
Study Area
Upper Tier Municipality
Durham
Walkerton
Mildmay
Teeswater
Clifford
Mount Forest
Harriston
Arthur
Drayton
Listowel
Elora
Milverton
Mitchell
Data Sources:
Agricorp (2006)
Ontario Ministry of Natural Resources (2005)
Ontario Ministry of Agriculture, Food and
Rural Affairs (2004)

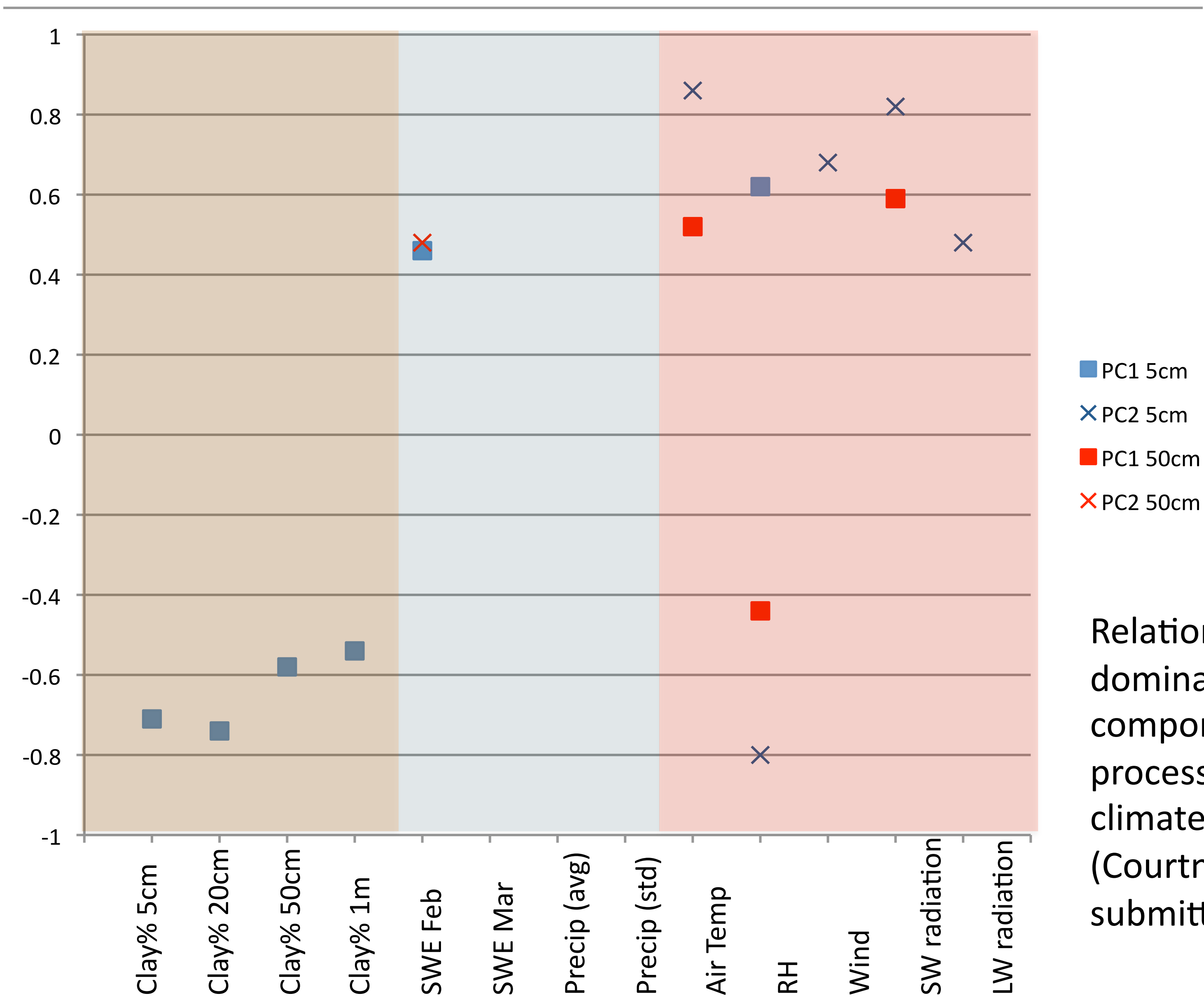
Process Controls on Soil Moisture Variability at the Regional Scale



Wetness Anomalies (Aug 2009)
(Champagne et al. 2011)

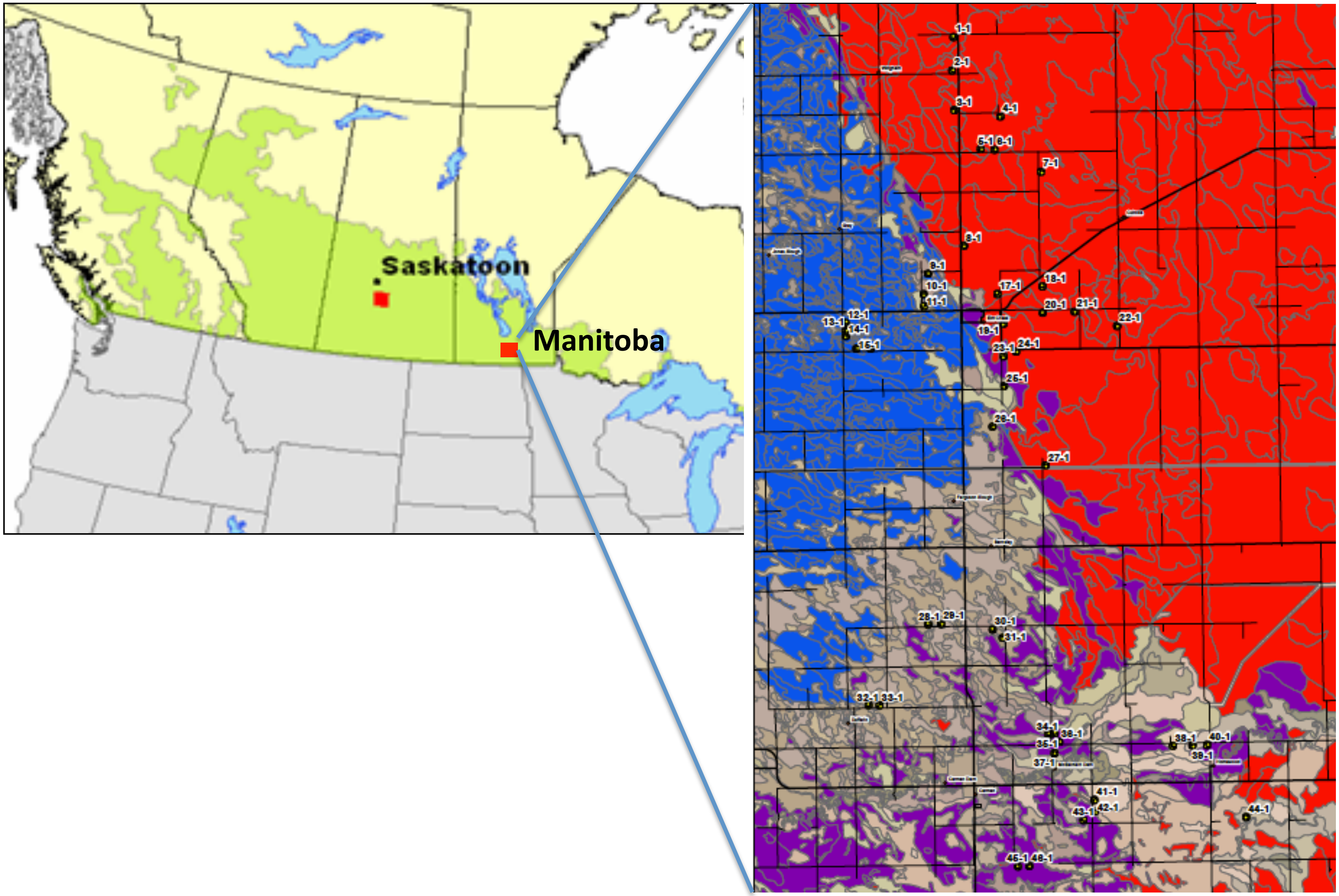


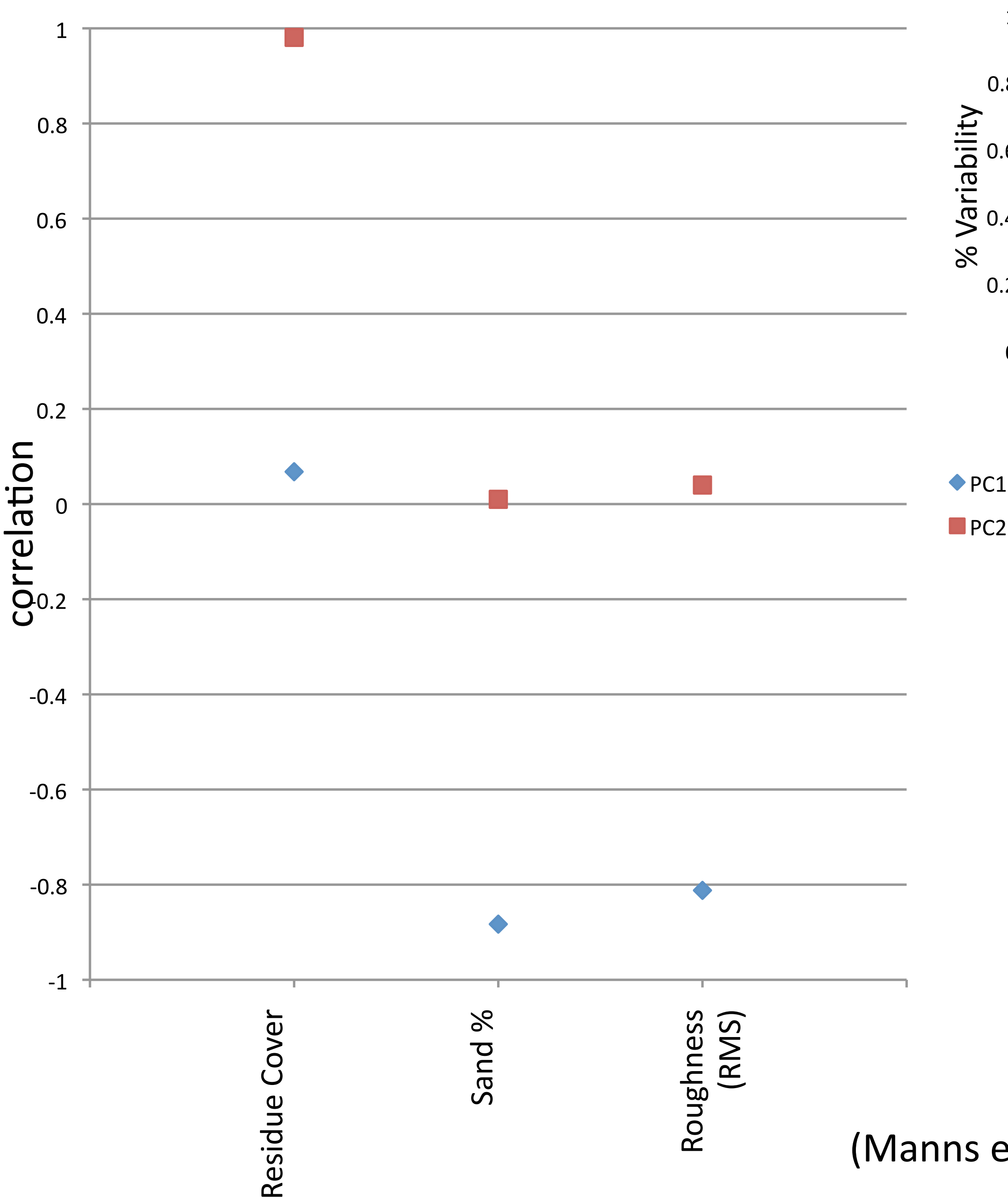
Percent of variability explained at various depths using PCA (Courtney et al. submitted)



Relationship of dominant principal components to physical processes (soil and climate variables) (Courtney et al. submitted)

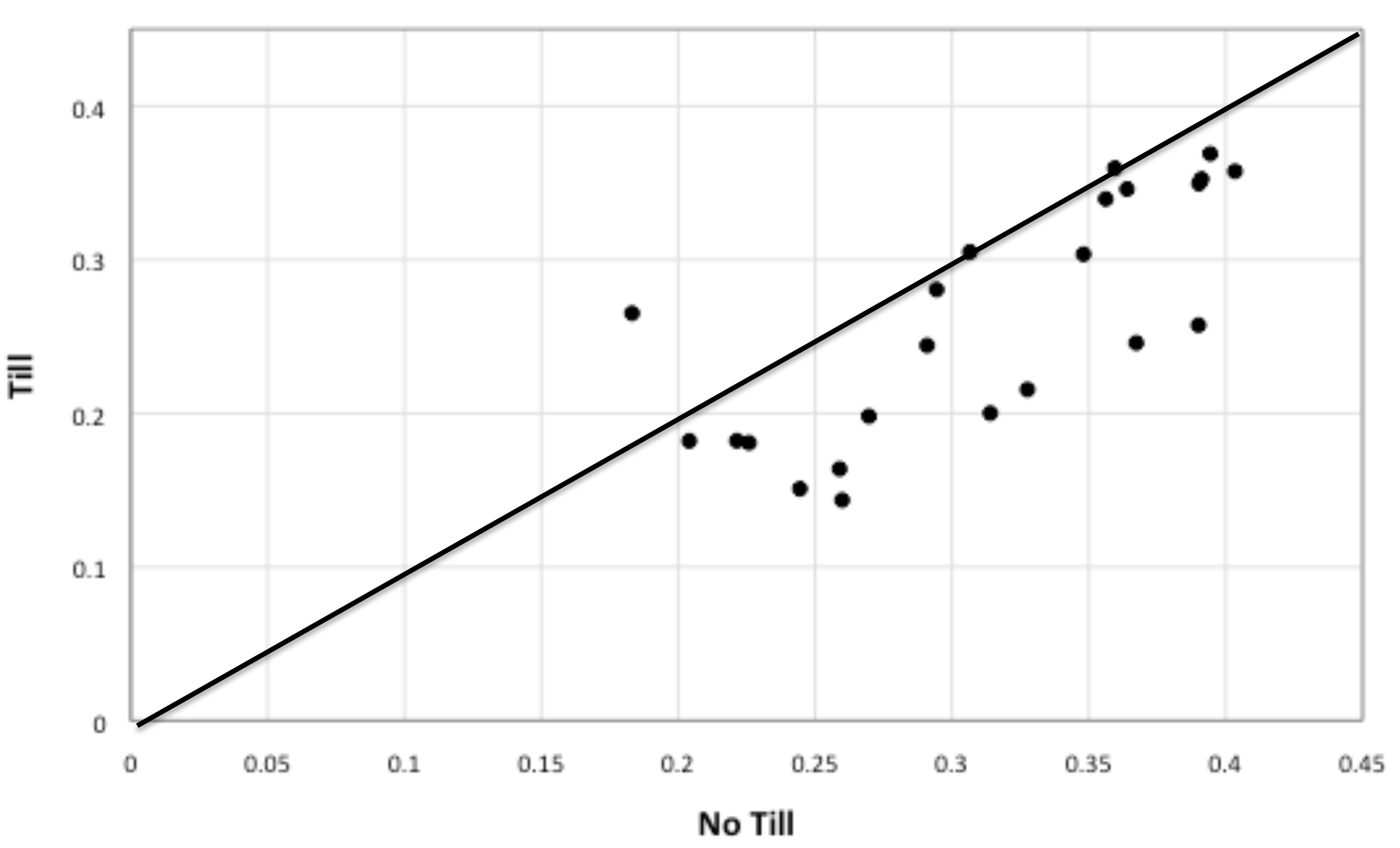
Soil Monitoring Moisture Networks in Canada





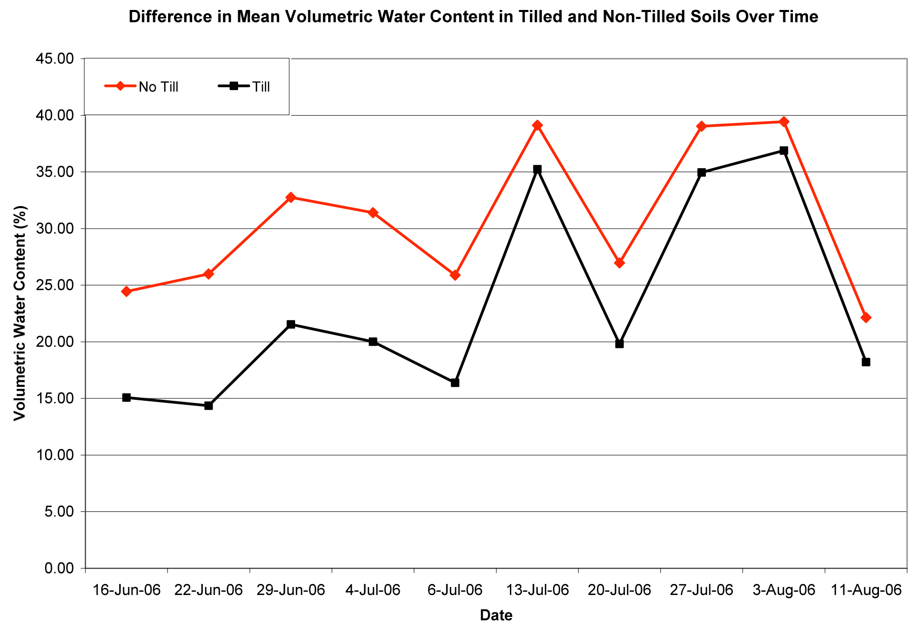
(Manns et al. in prep)

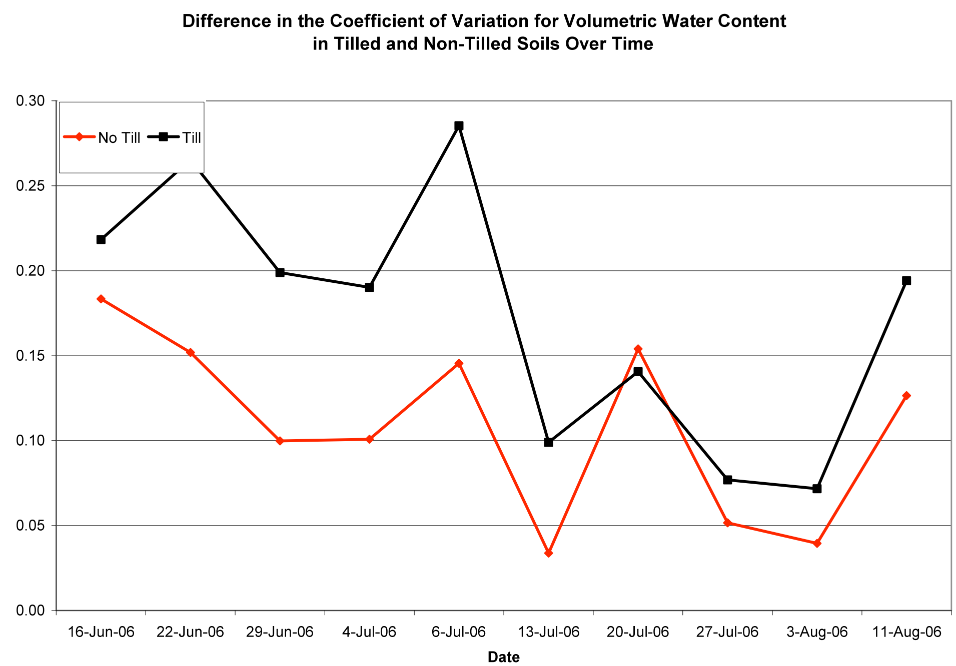
Impacts of Land-use Practices
Tillage



Impacts of Land-use Practices:

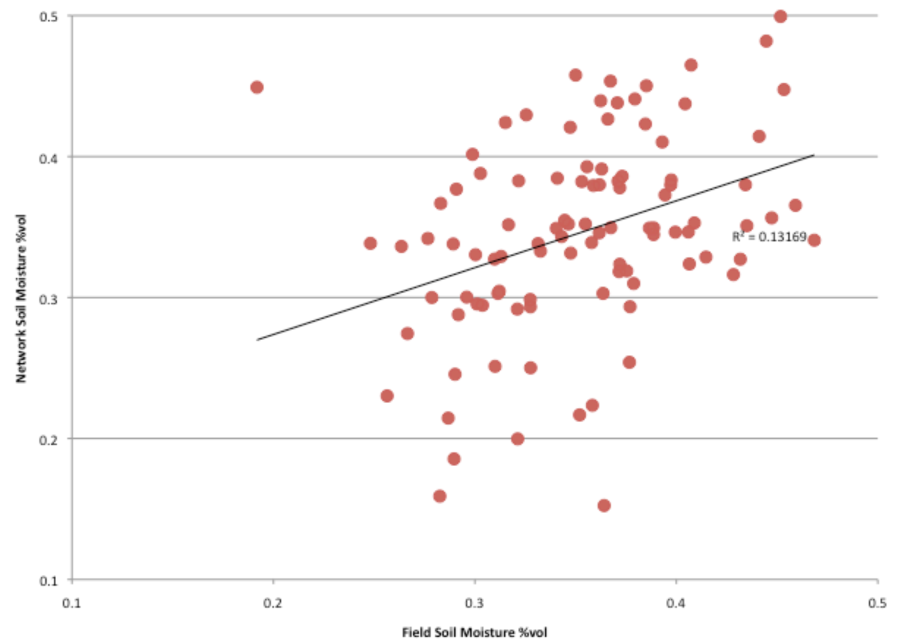
Tillage

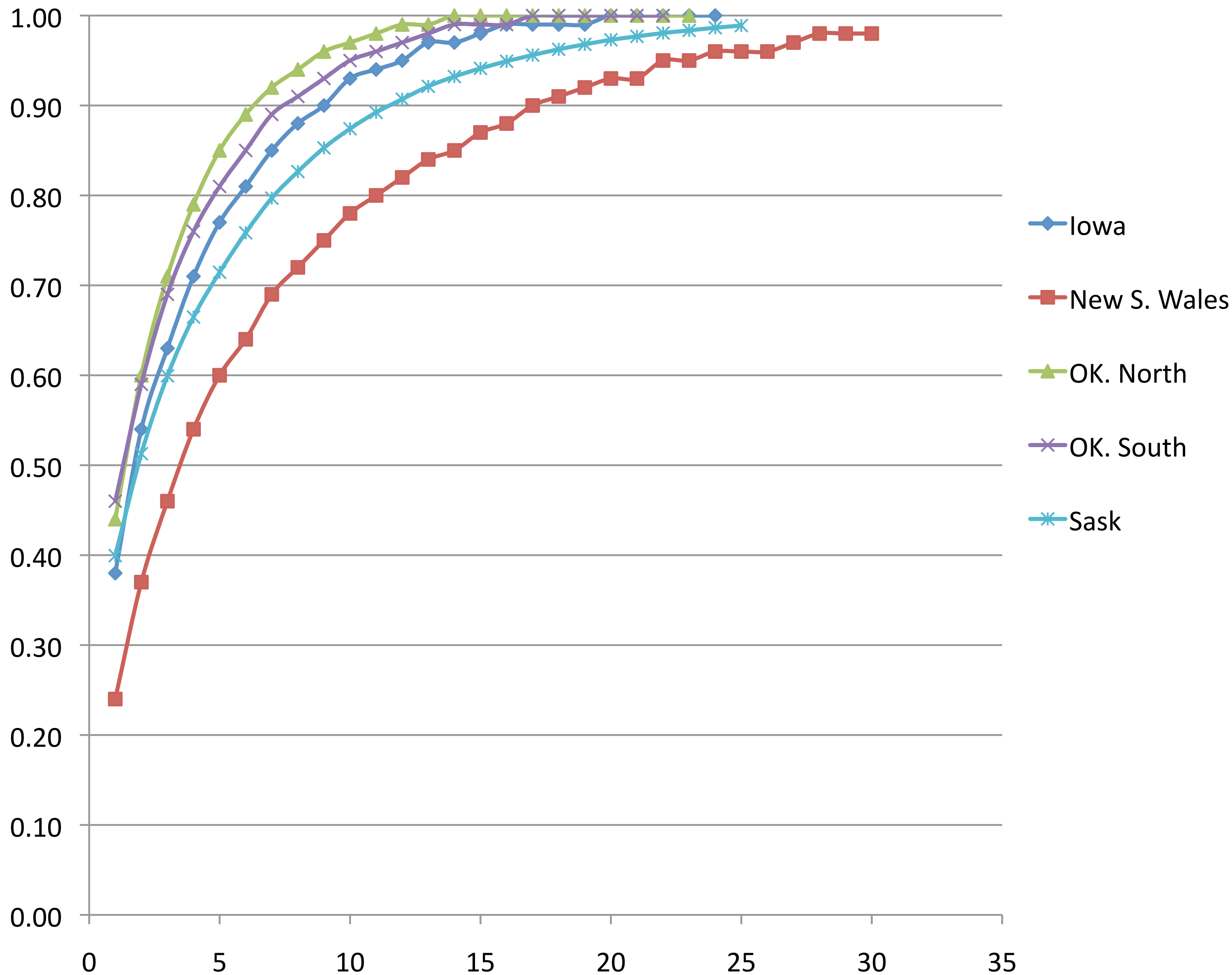




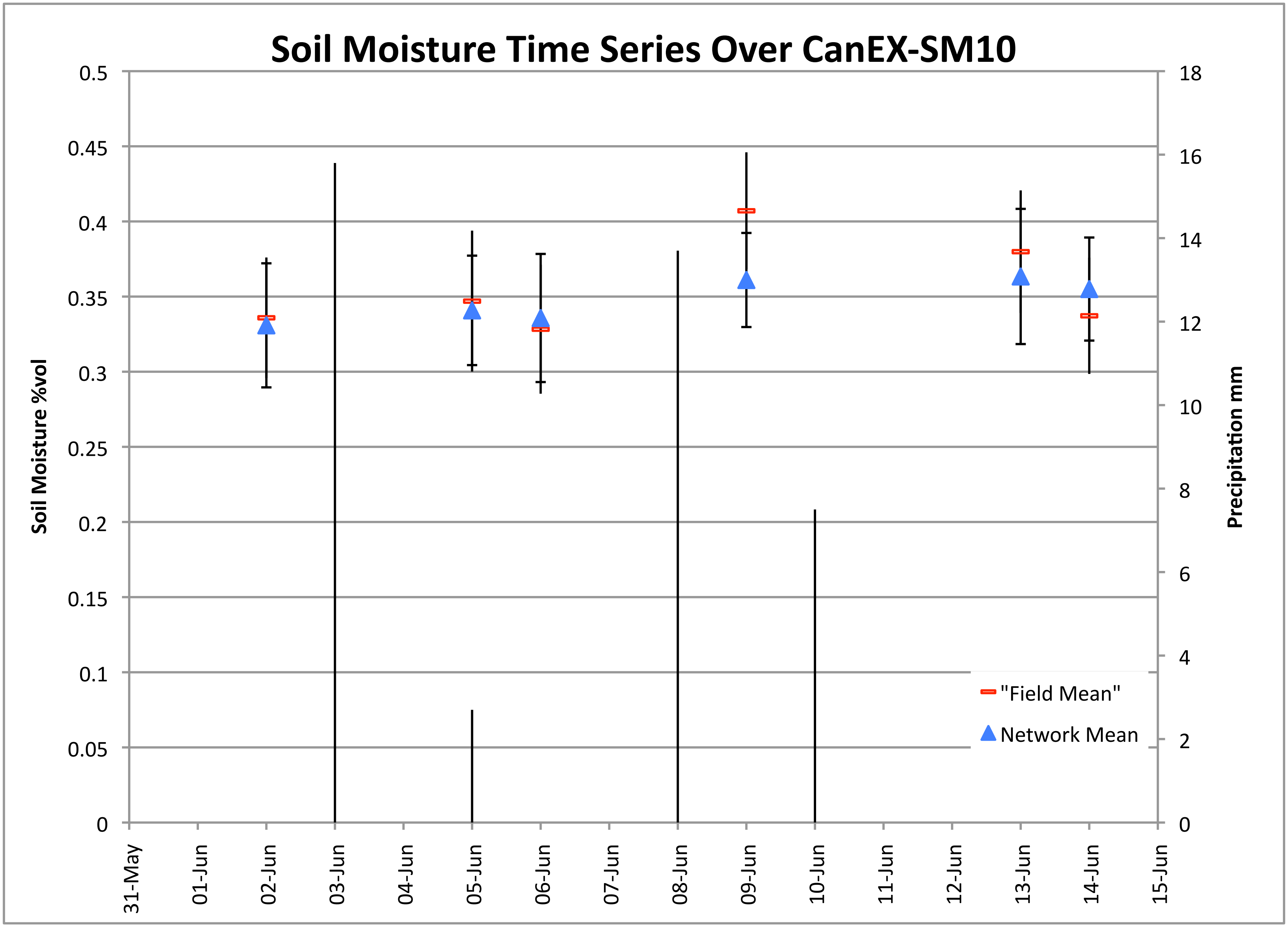
Design of Representative Monitoring Networks

- Some difficulties in the development monitoring networks
  - Stable long-term measurement locations are difficult to place in the actively managed areas that represent the largest area.

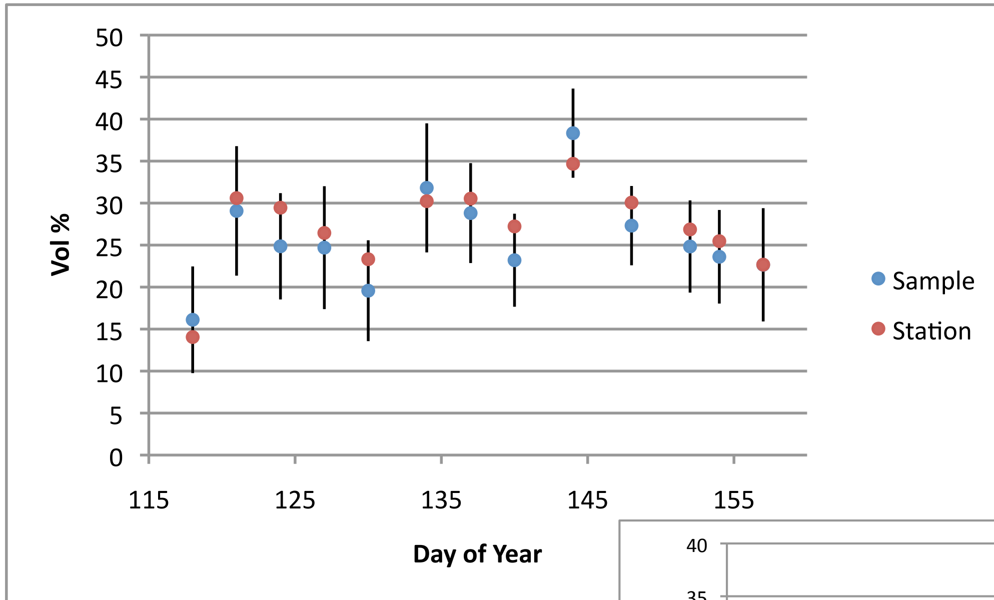


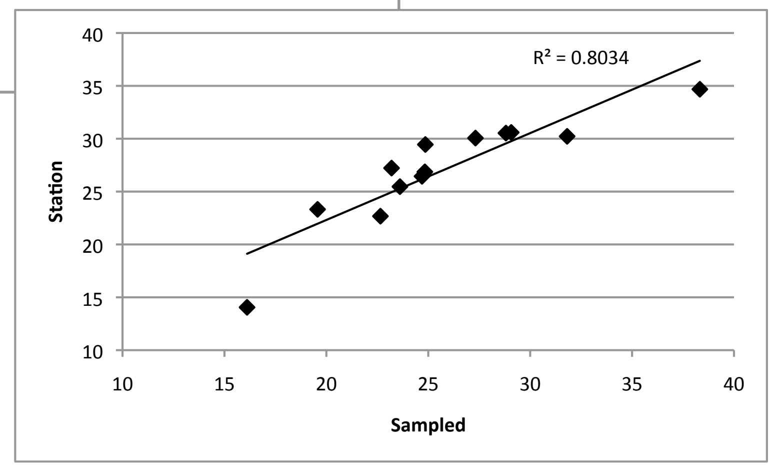


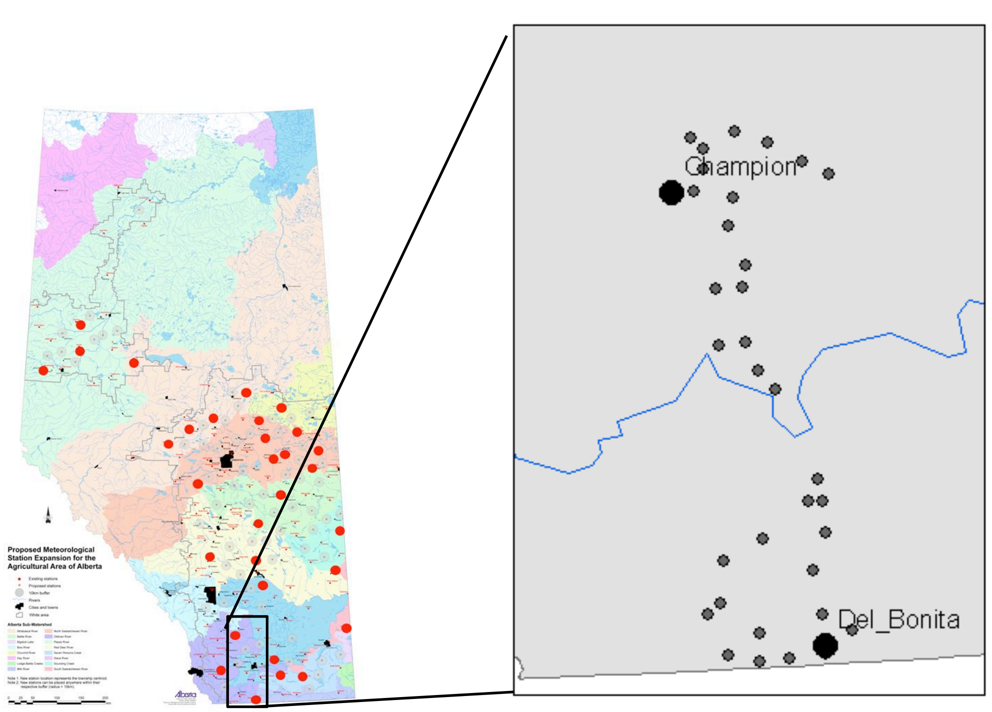
How many samples are necessary to get within +/- 0.04 at 95% (Hansen 2007)



Soil Moisture Time Series Over CanEX-SM10
Soil Moisture %vol
Precipitation mm
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
18
16
14
12
10
8
6
4
2
0
31-May
01-Jun
02-Jun
03-Jun
04-Jun
05-Jun
06-Jun
07-Jun
08-Jun
09-Jun
10-Jun
11-Jun
12-Jun
13-Jun
14-Jun
15-Jun
"Field Mean"
Network Mean







Using short field experiments single sites can be evaluated to examine how representative they are

Collaborators, Funding and Support

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