

Airborne Hyperspectral Vegetation Products over Mer Bleue Canada:

Its Use as a Surrogate Northern Bog

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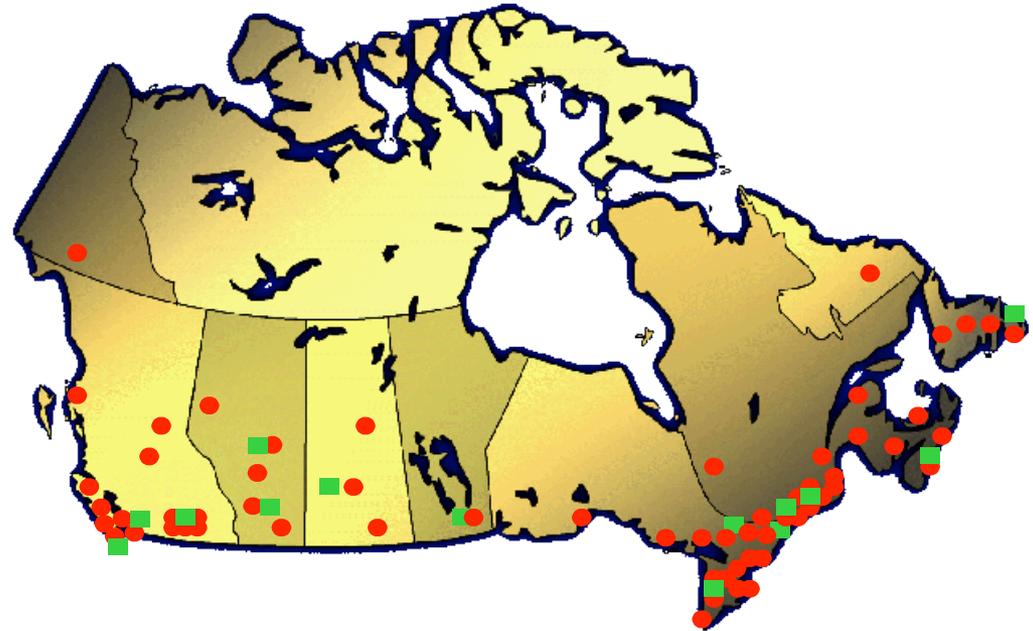
National Research
Council Canada

Conseil national
de recherches Canada

Canada 

National Research Council of Canada (NRC)

- Federal Government Agency
- 4,500 full-time employees, 1,000 guest workers
- Labs and facilities across Canada
- Network of technology advisors to support small business



Mandate: “The Council has charge of such matters affecting scientific and industrial research in Canada as may be assigned to it by the Governor in Council”

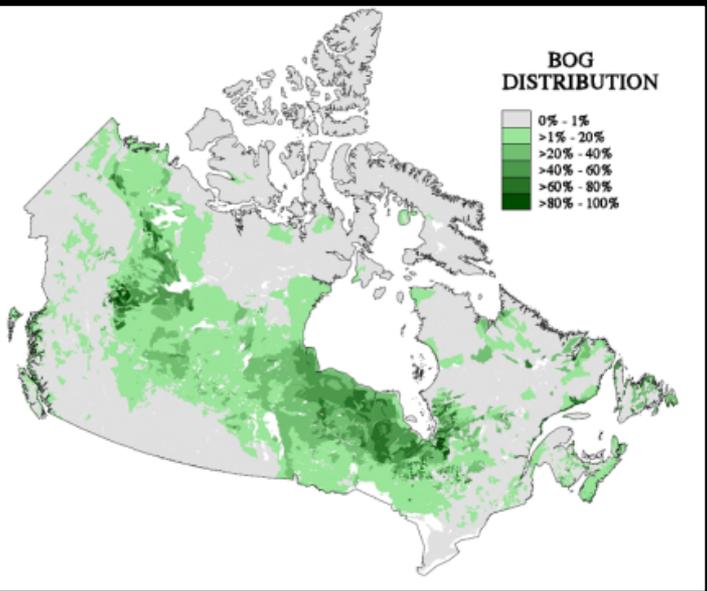
Our Aircraft Fleet



Mer Bleue as an Arctic Surrogate Site at 45°24'N

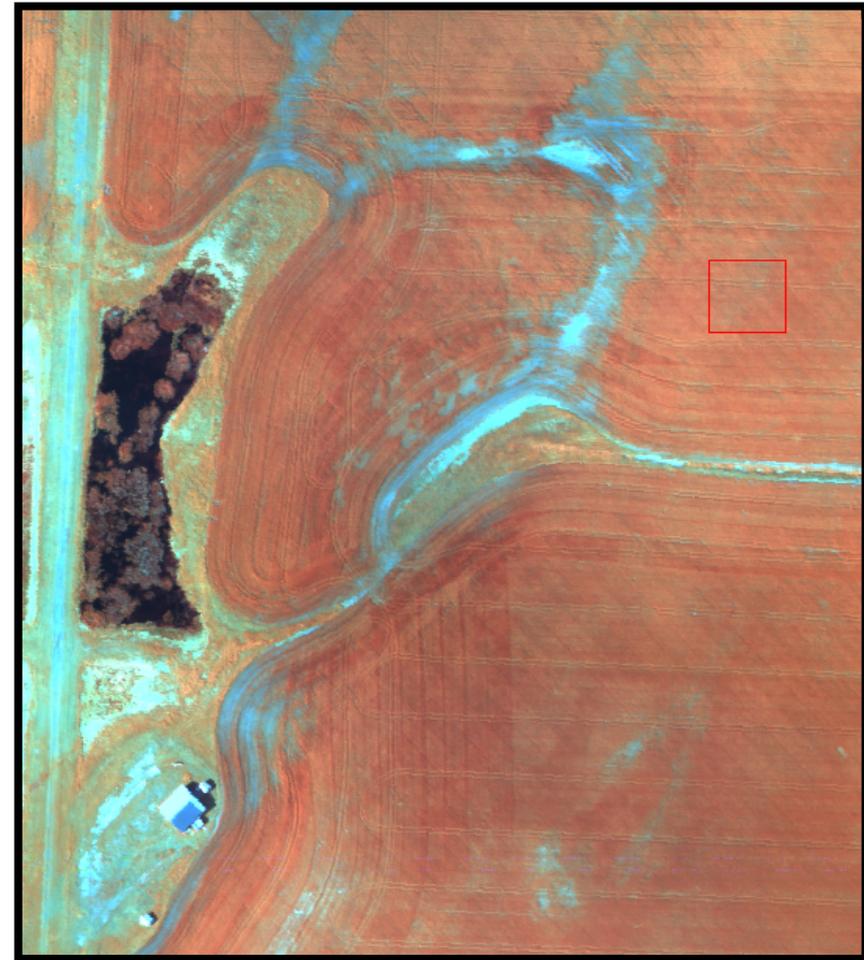
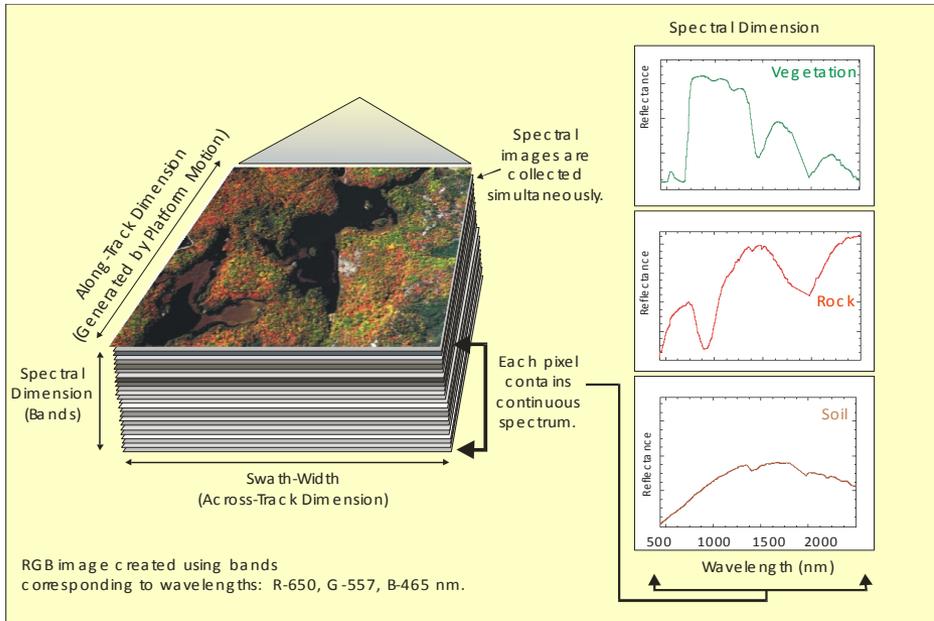
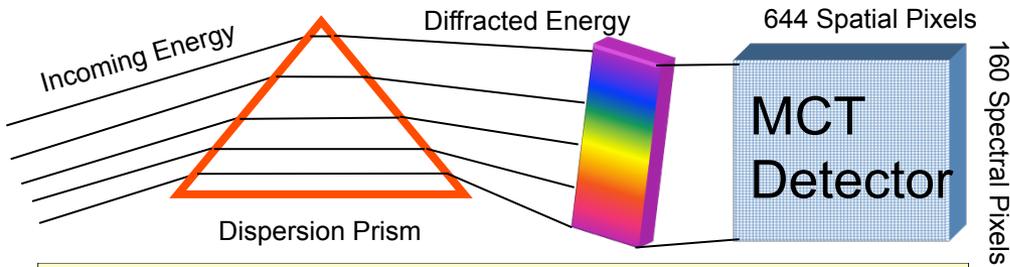
Why:

- Mer Bleue is an ombrotrophic bog.
- Drawing-down of the water table – drying out
- Sphagnum, cotton grass, sages...etc
- Carbon sequestration and release
- VOC release during heating..
- Location and infrastructure access



Hyperspectral Process

Spectral method: recording the reflected radiation from a target with a CCD or FPA



Georectified Shortwave Infrared image with R = 1051nm, G = 1623nm and B = 2121 nm.

Airborne Hyperspectral Capability

SWIR (SASI)

Pushbroom

37.8degree FOV

1.14 mrad IFOV

1.8 f-number

644 spatial pixels

160 channels

850 nm-2500 nm range

14 bit

16.7 ms Frame Rate

CMIGIT III GPS/INS

VIS/NIR (CASI)

Pushbroom

37.7degree FOV

1.2 mrad IFOV

F3.5-F18.0 f-number

1500 spatial pixels

288 spectral channels

365 nm-1050 nm range

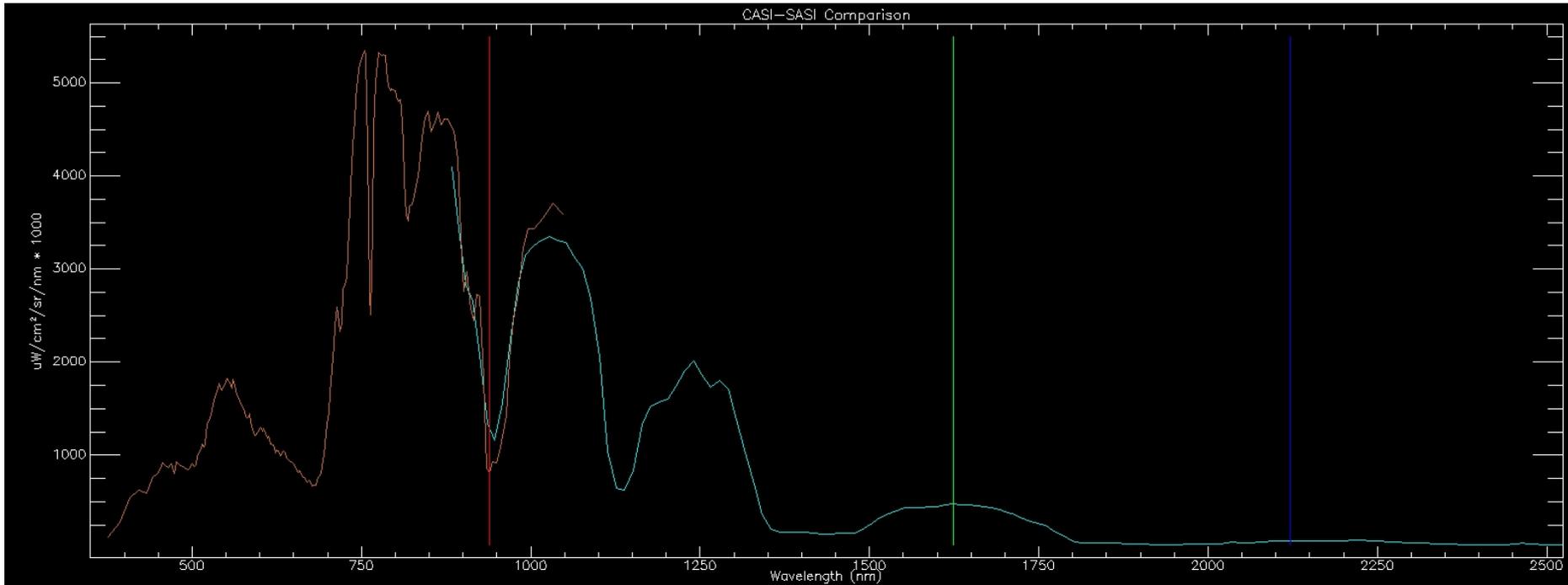
14 bit

variable Frame Rate

CMIGIT III GPS/INS



Semi-Coaligned Imagers

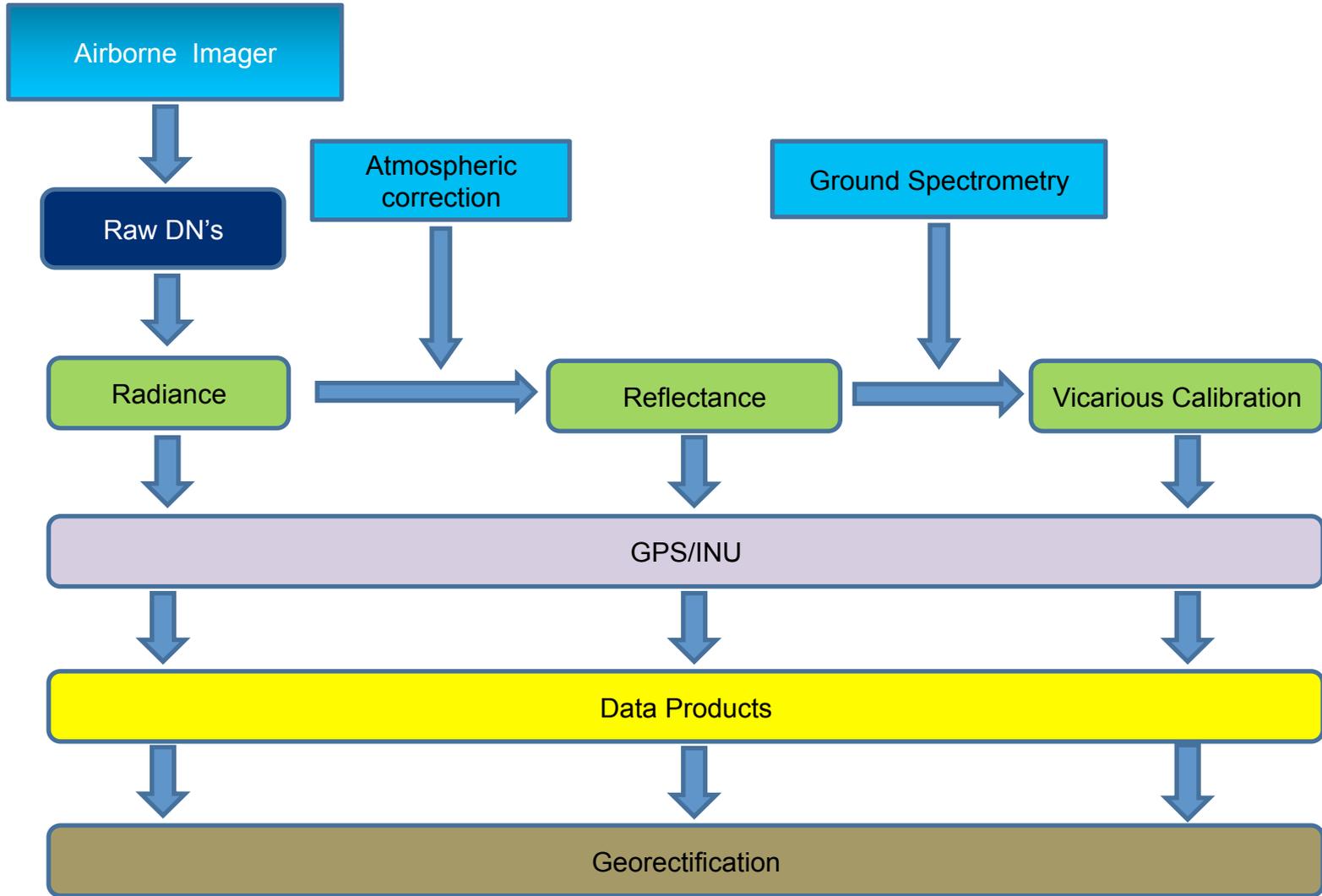


Up to 25% variance in the overlap region

Not the exact same area being observed.

Very difficult to get a spectrally homogenous target over 10X10m region with sufficient signal for good comparison

Simplified Schematic of Hyperspectral Processing

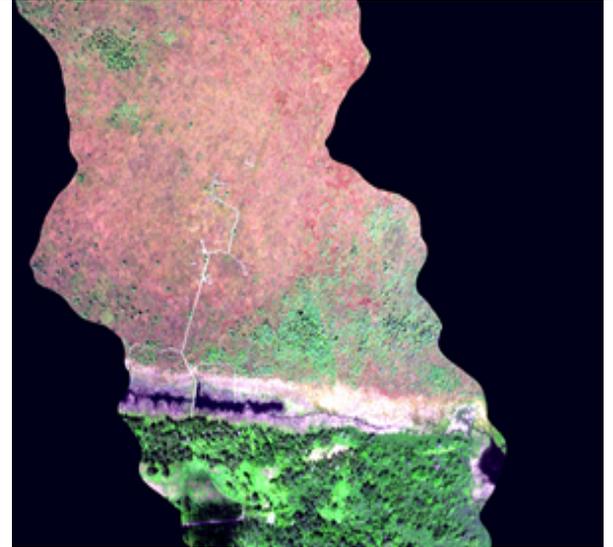


True Colour



April
29 2015

June
4 2015



August
28 2015

September
16 2015



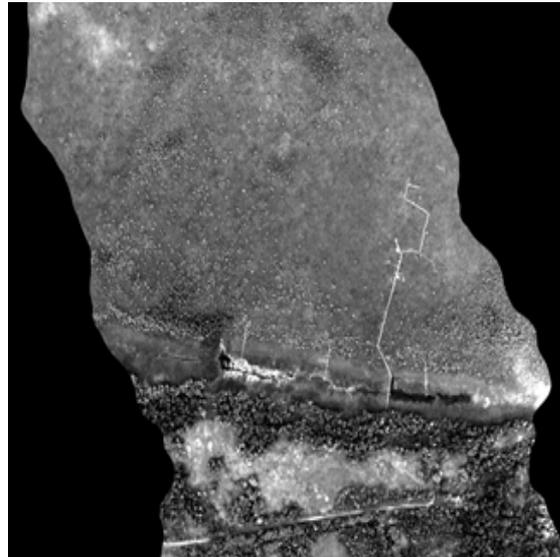
VI's for August 28 2015 as an Example

NDVI



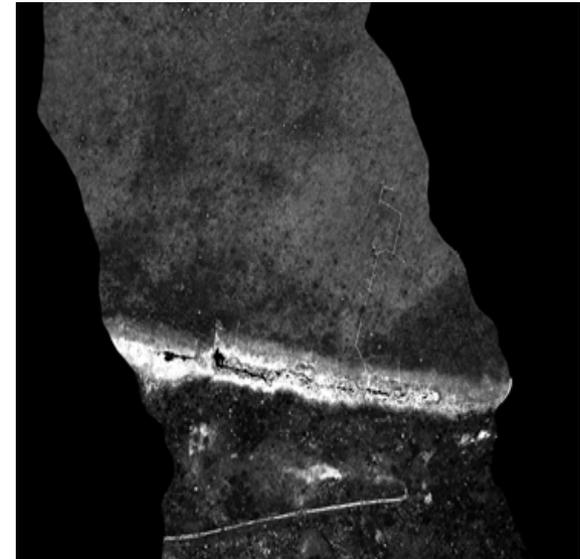
Range -1 to 1
Healthy veg 0.2-0.8
Study area 0.06-0.98
**Indicates increased
Chlorophyll to NIR**

SGLI



Range 0.0-0.5
Healthy veg 0.1-0.25
Study area 0.01-0.5
**Indicates increased
broadband "greenness"**

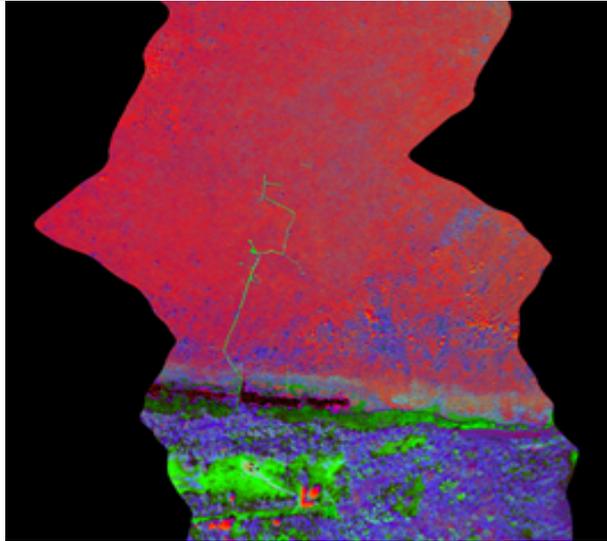
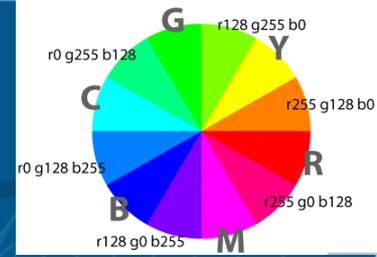
SIPI



Range 0.0-2.0
Healthy veg 0.8-1.8
Study area 1.03-1.82
**Indicates increased
canopy stress**

Issues with each VI...e.g. NDVI does not increase at same rate of increased greenness in high biomass areas.

NDVI (R), SGI(G), SIPI(B)



April
29 2015

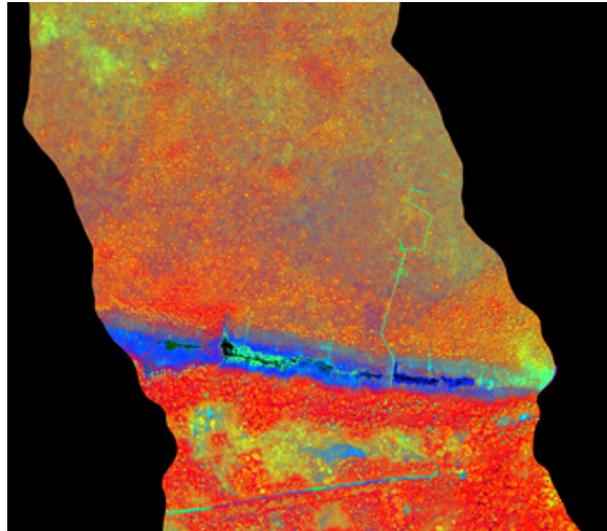
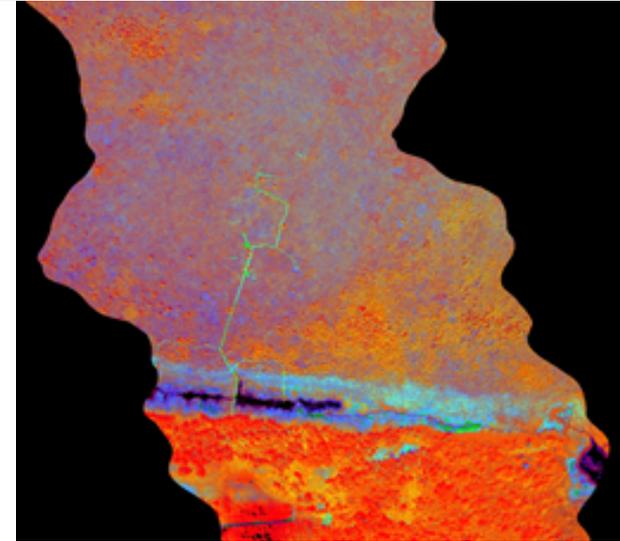
Poor healthy
veg. cover

Tress are
stressed
Grasses
Starting
growing

June
4 2015

Growth going
Well.

Healthy trees
Greening of
veg



August
28 2015

Some reduction
In greenness

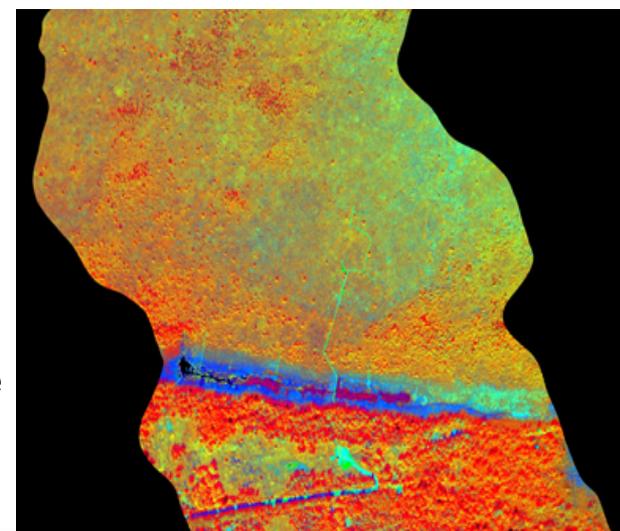
Still mostly
heathy veg.

Grasses showing
stress

September
16 2015

Increased stress
and decreased
greenness

After senescence



Landsat 8 Derived NDVI Compared to Airborne

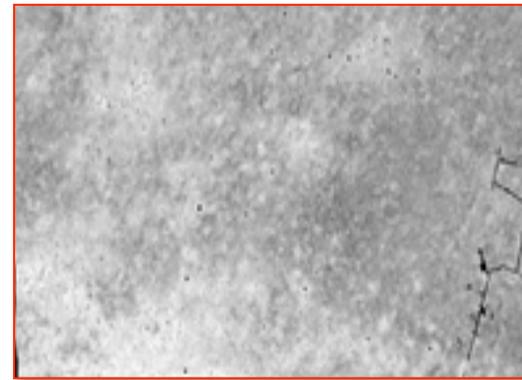
August 18 2015



Study area 0.70-0.9

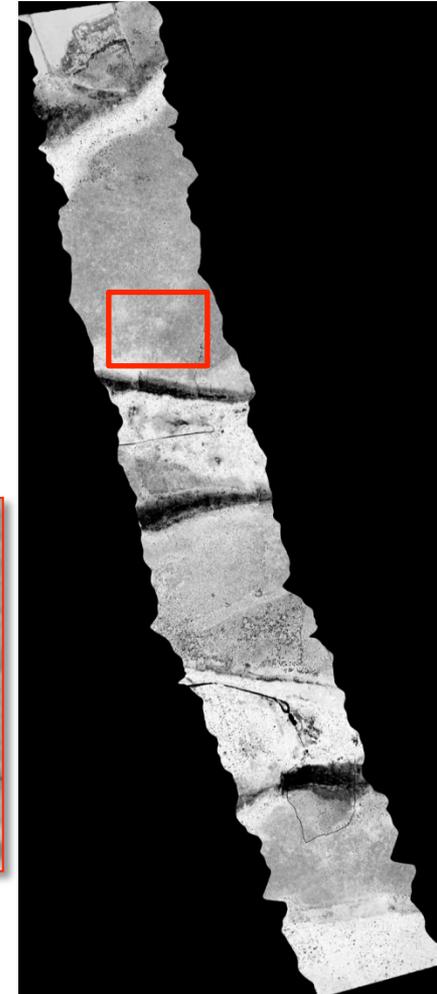
NRCan to
Upscale to
Satellite level

Range -1 to 1
Healthy veg 0.2-0.8



Study area 0.4-0.9
Boardwalk not included

August 28 2015



Onward....

Analysis of all remaining CASI data acquired for 2015.

Analysis of all SWIR data from 2015.

Development of dedicated project, in conjunction with ESA, to characterize the Mer Bleue site in the spring/summer of 2016

Collection of data from contact spectra through to satellite (LS08) scale

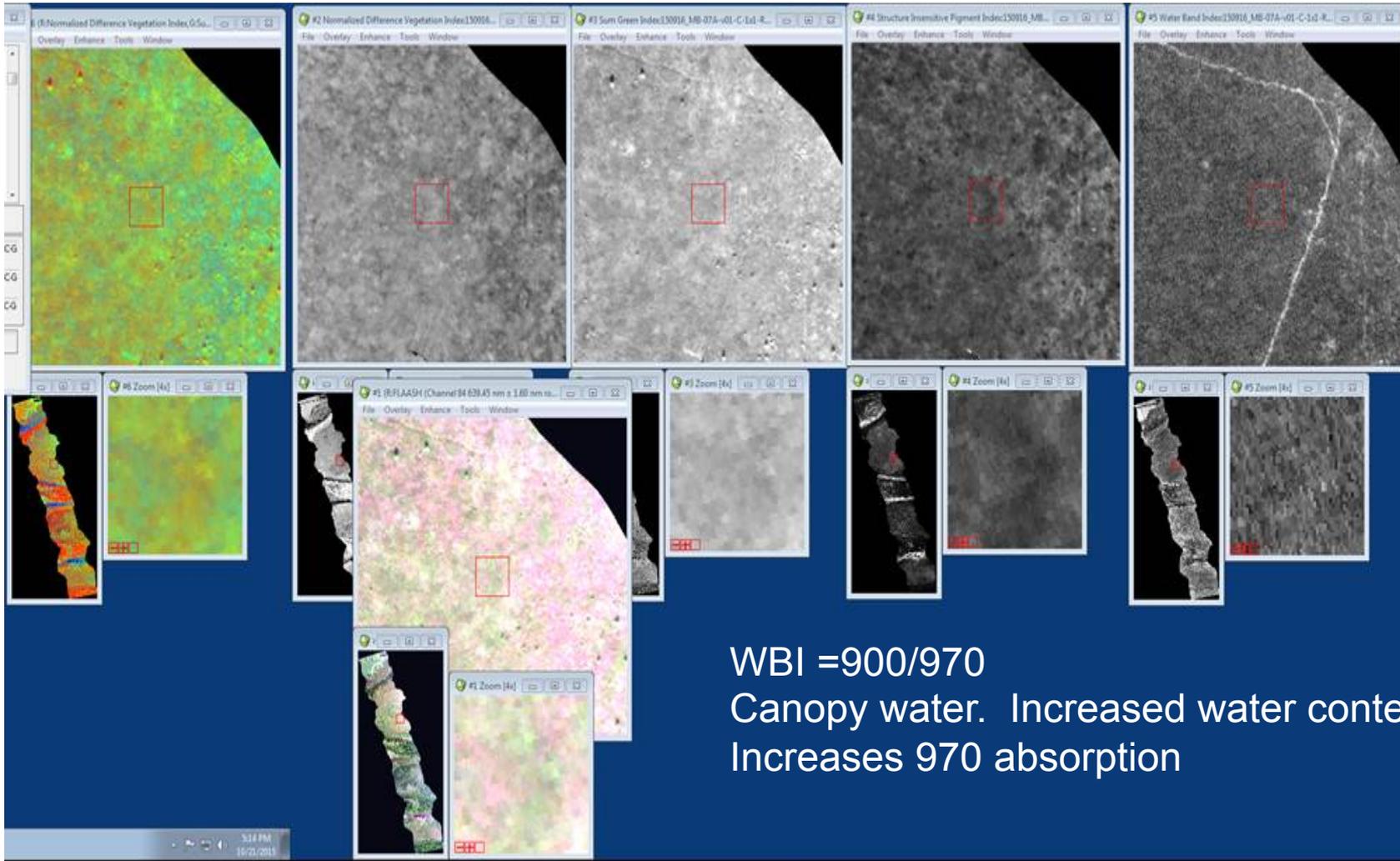
Extraction of SWIR data to include some VI's as well as water stress, Lignin...

Extensive collection and assembly of local spectral from vegetation and soils...

Questions?



Incidental finding – pathways in water



WBI = 900/970
Canopy water. Increased water content
Increases 970 absorption