Pixels to data products for forest monitoring: Mass data processing of time-series Landsat imagery

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Natural Resources Canada
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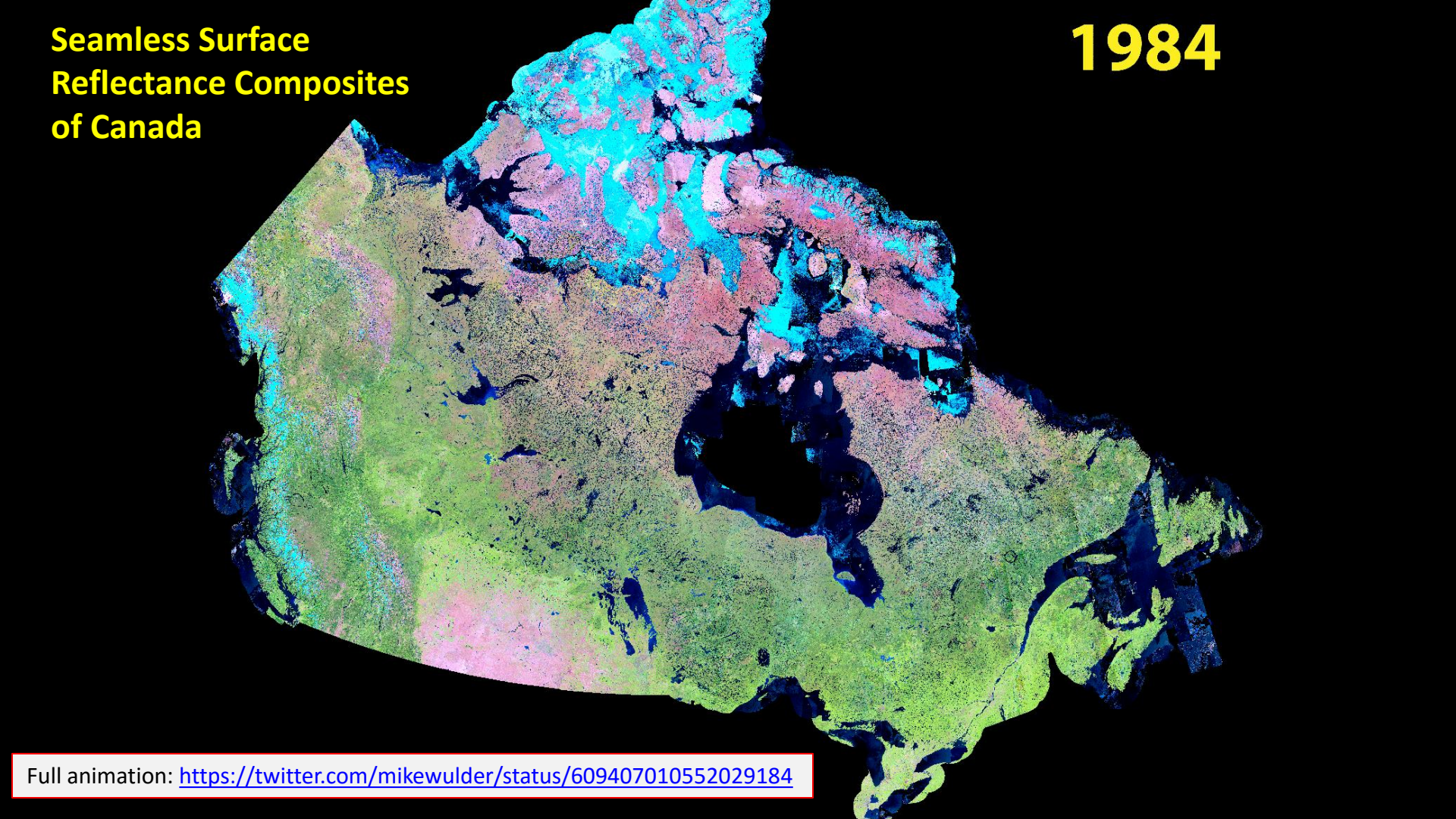
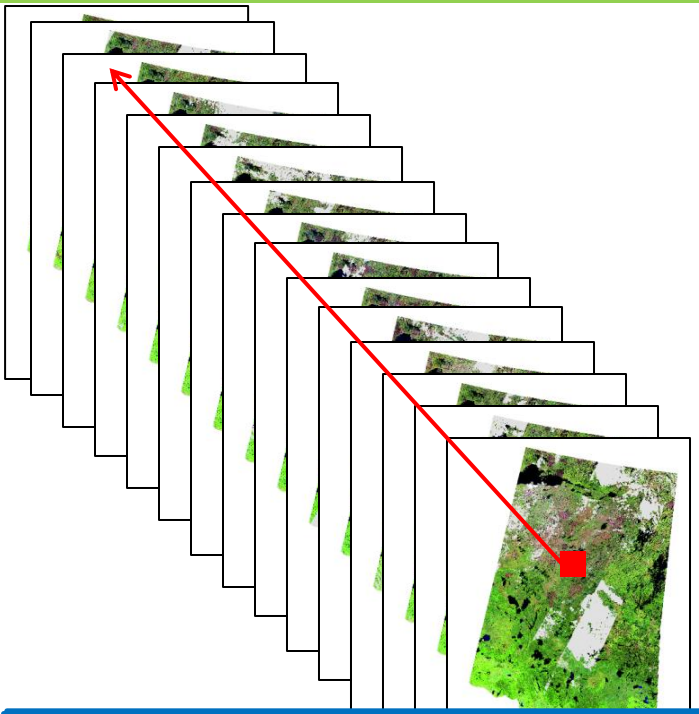
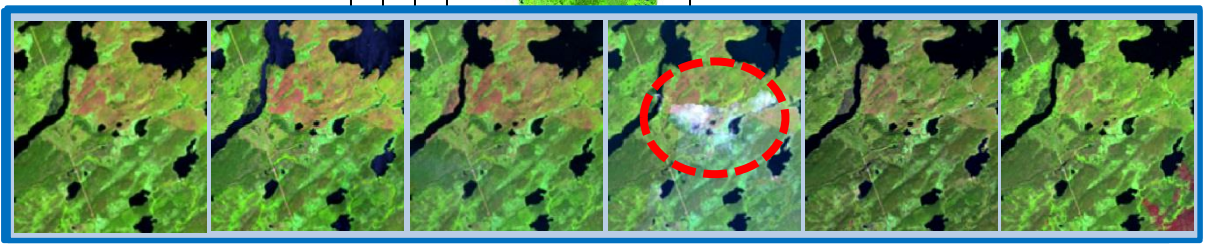


Full animation: https://twitter.com/mikewulder/status/609407010552029184

Time-series analysis





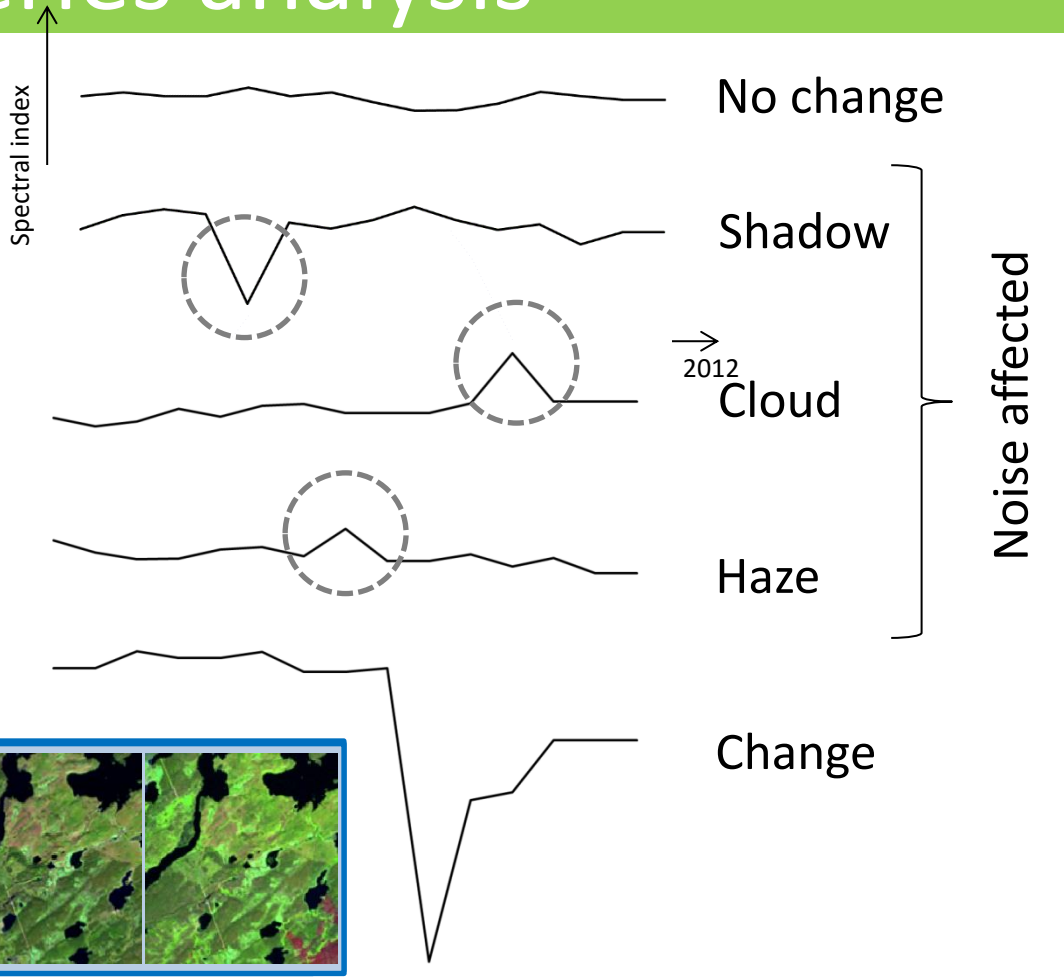
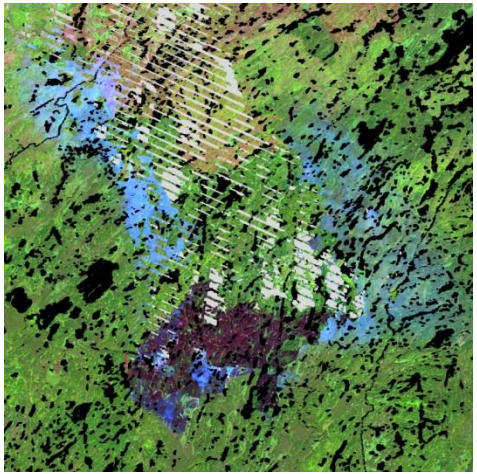


Image compositing process

1. Annual BAP composites



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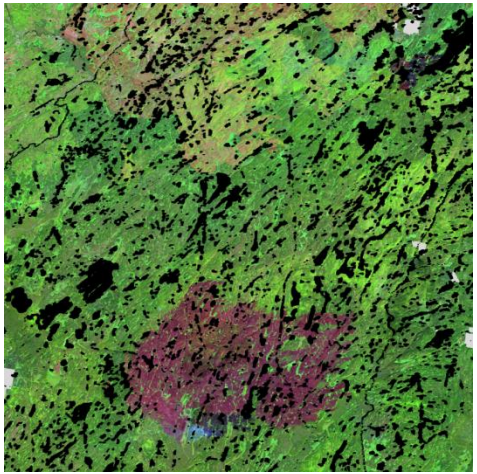

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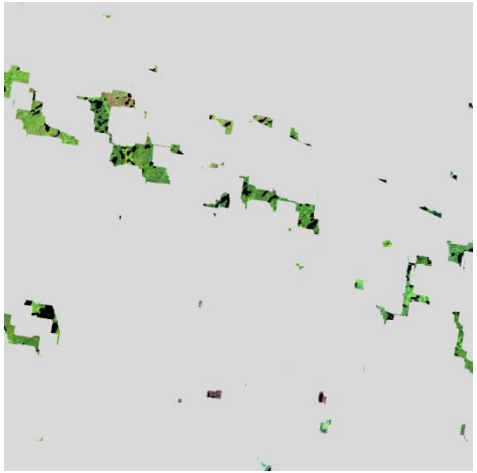
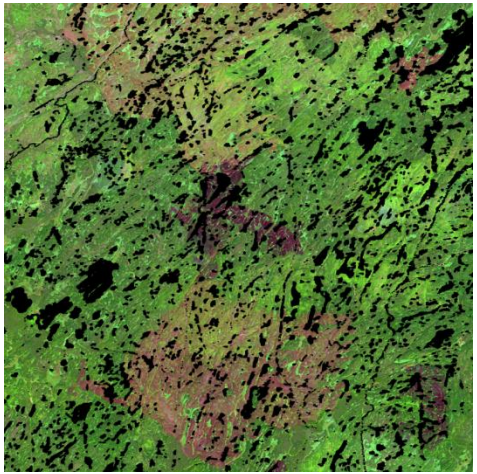


2006



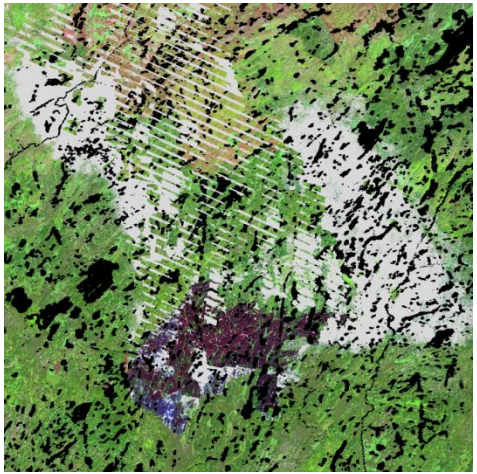
2007

Reference: Hermosilla, T., Wulder, M.A., White, J.C., Coops, N.C., Hobart, G.W. 2015. An integrated Landsat time series protocol for change detection and generation of annual gap-free surface reflectance composites. Remote Sensing of Environment 158, 220–234. http://dx.doi.org/10.1016/j.rse.2014.11.005

Data gap

Image compositing process

2. Noise detection



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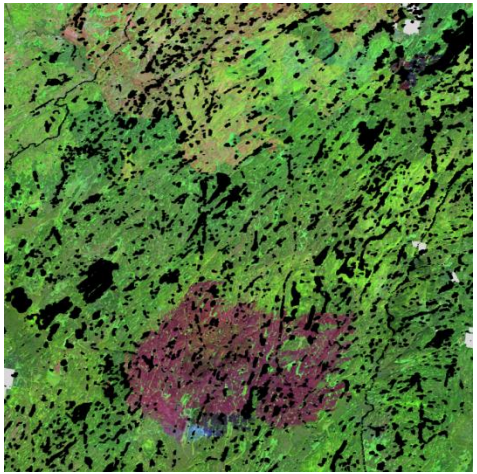

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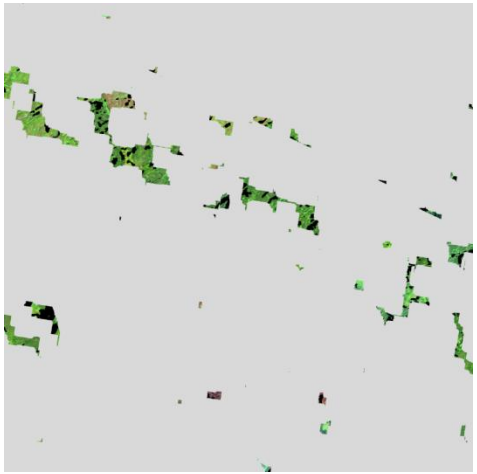

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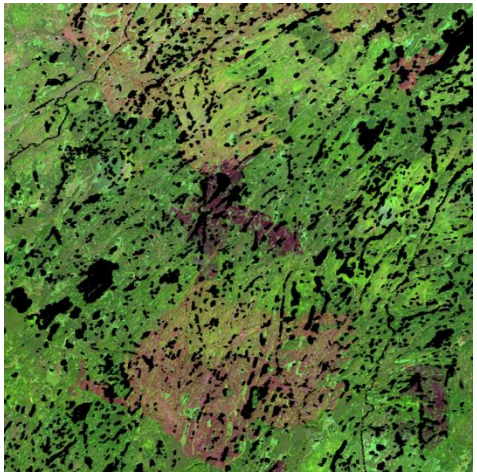

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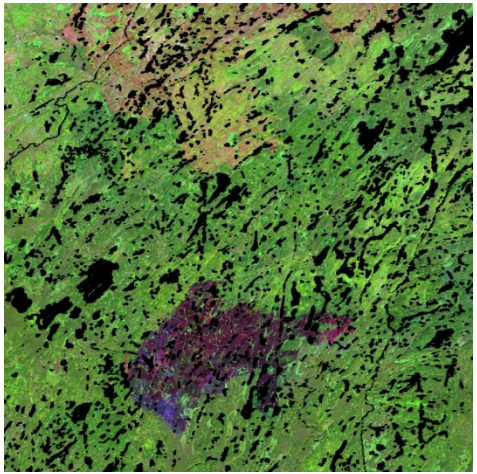
Data gap

Image compositing process

3. Annual proxy composites



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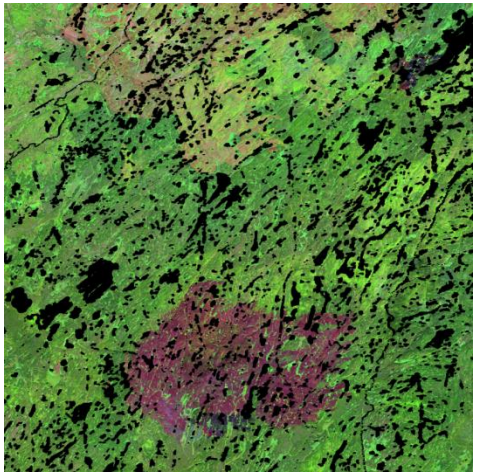

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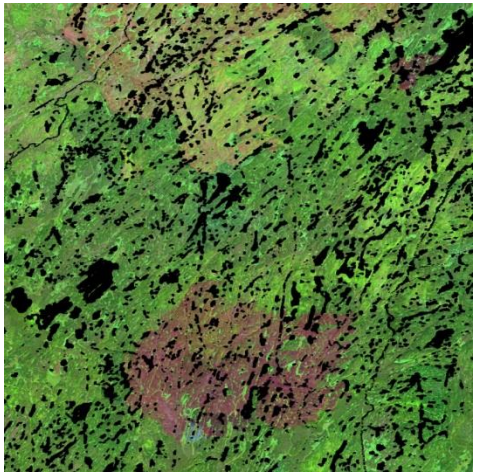

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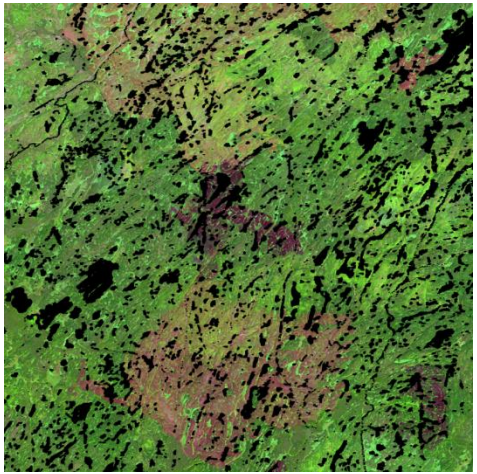

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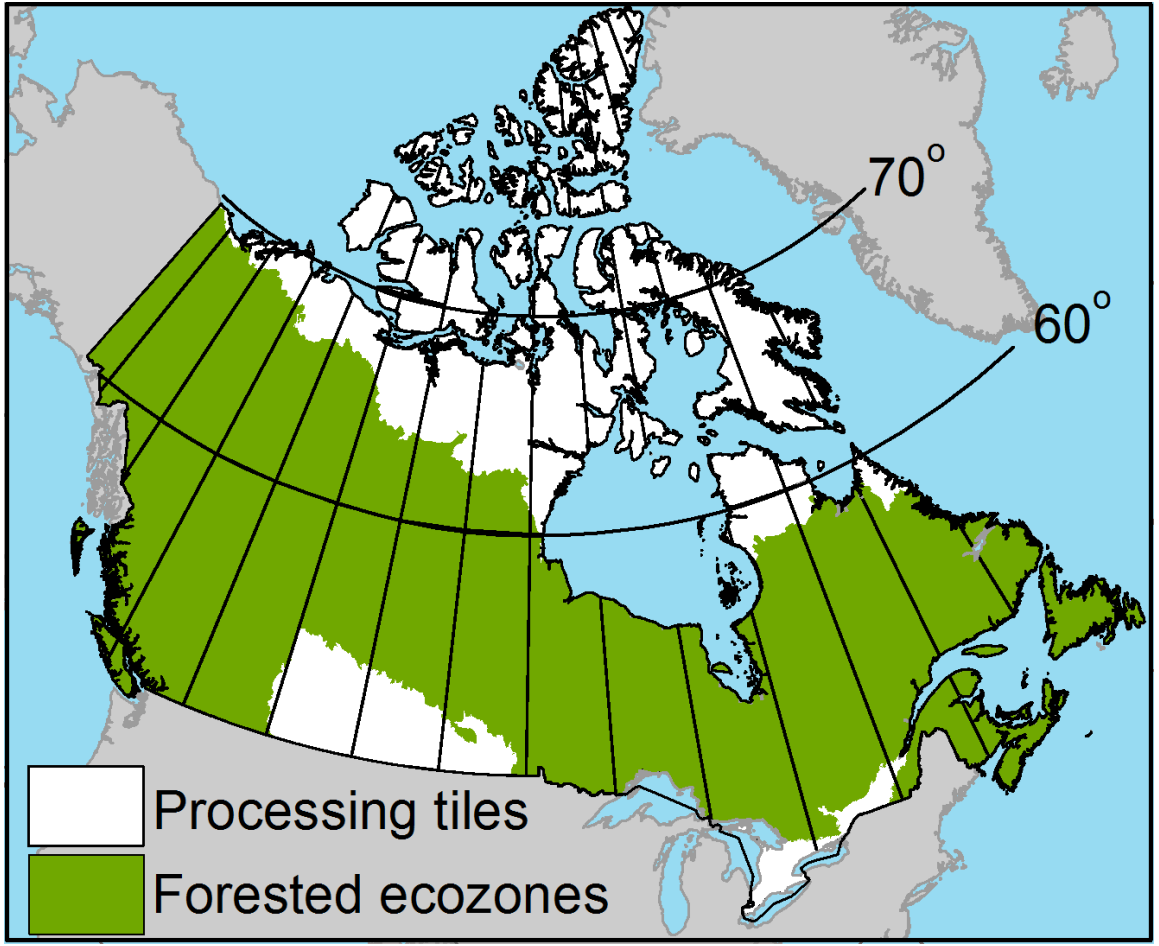
Data gap

Processing strategy



16 UTM zones (7-22)

3 latitudinal zones

Overlap: 30-90%

Image compositing assessment

Data gaps

Noise detection 8%

Compositing

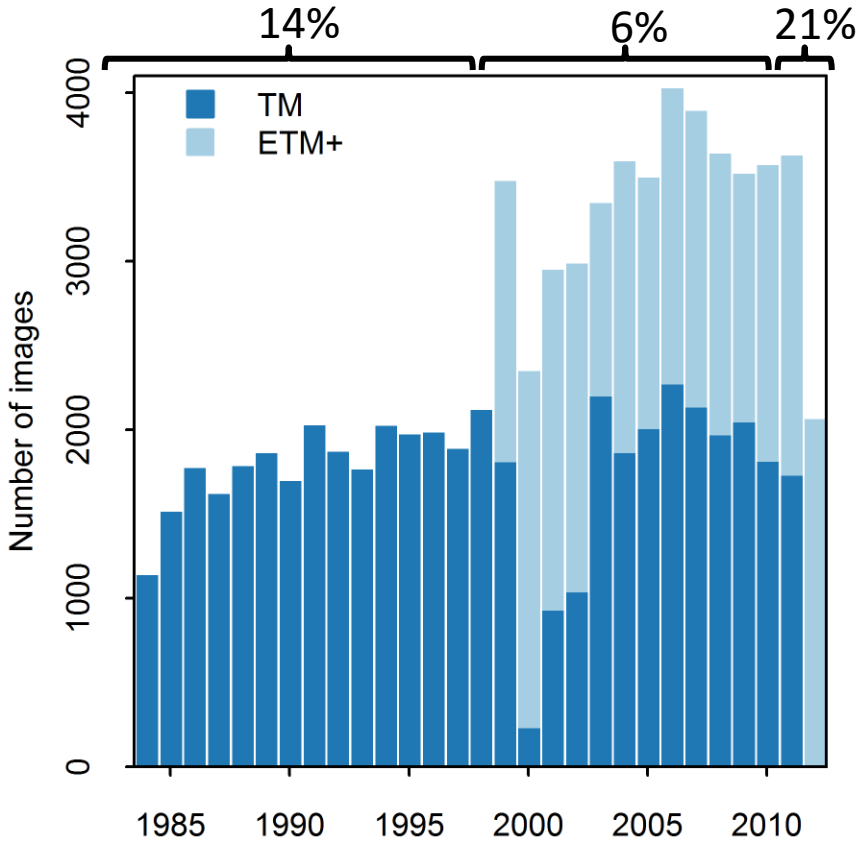


Image compositing assessment

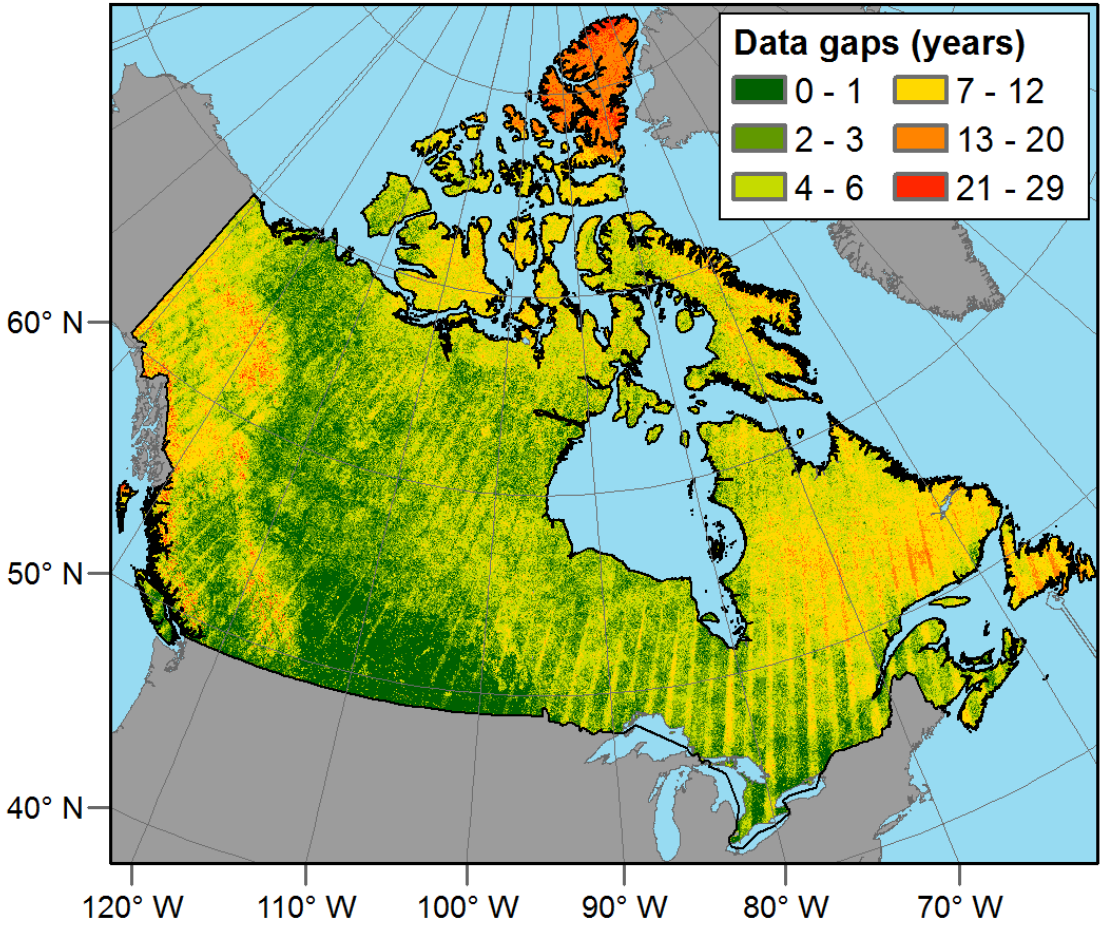
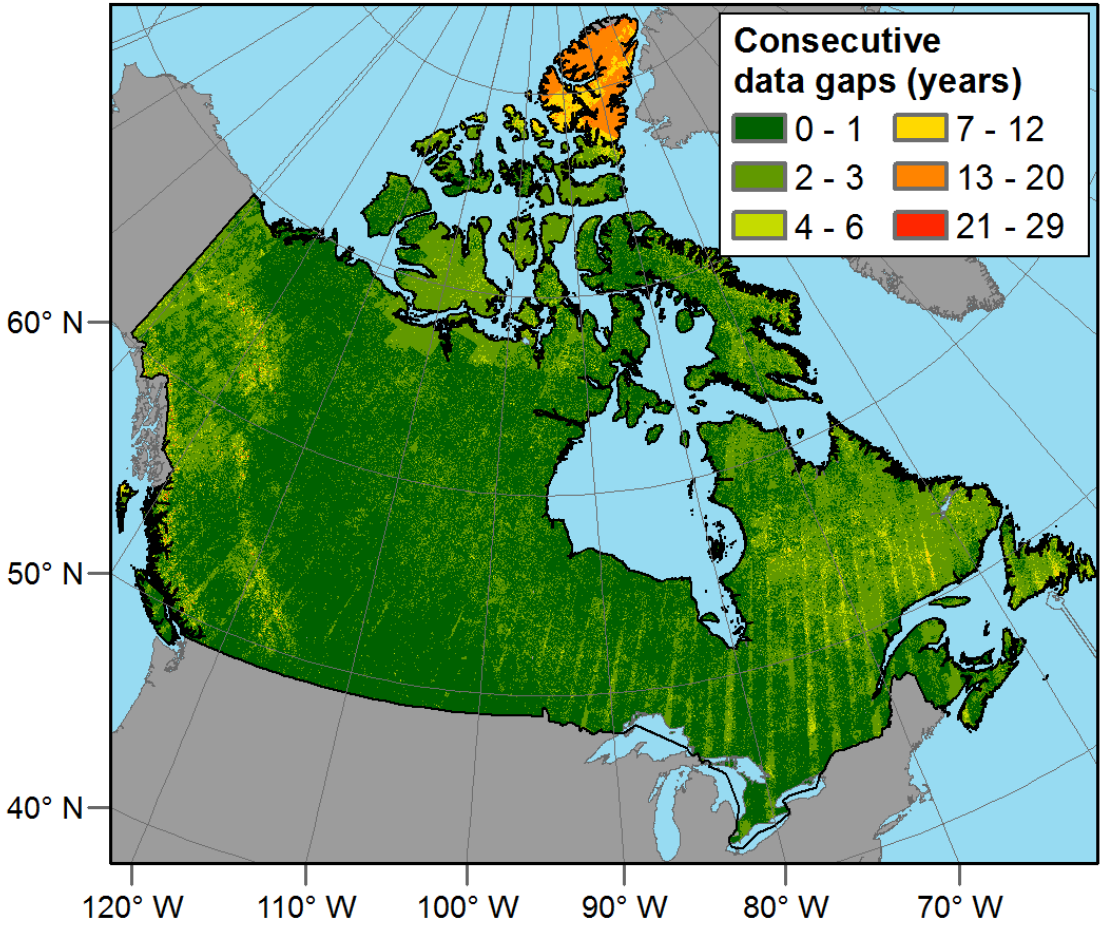
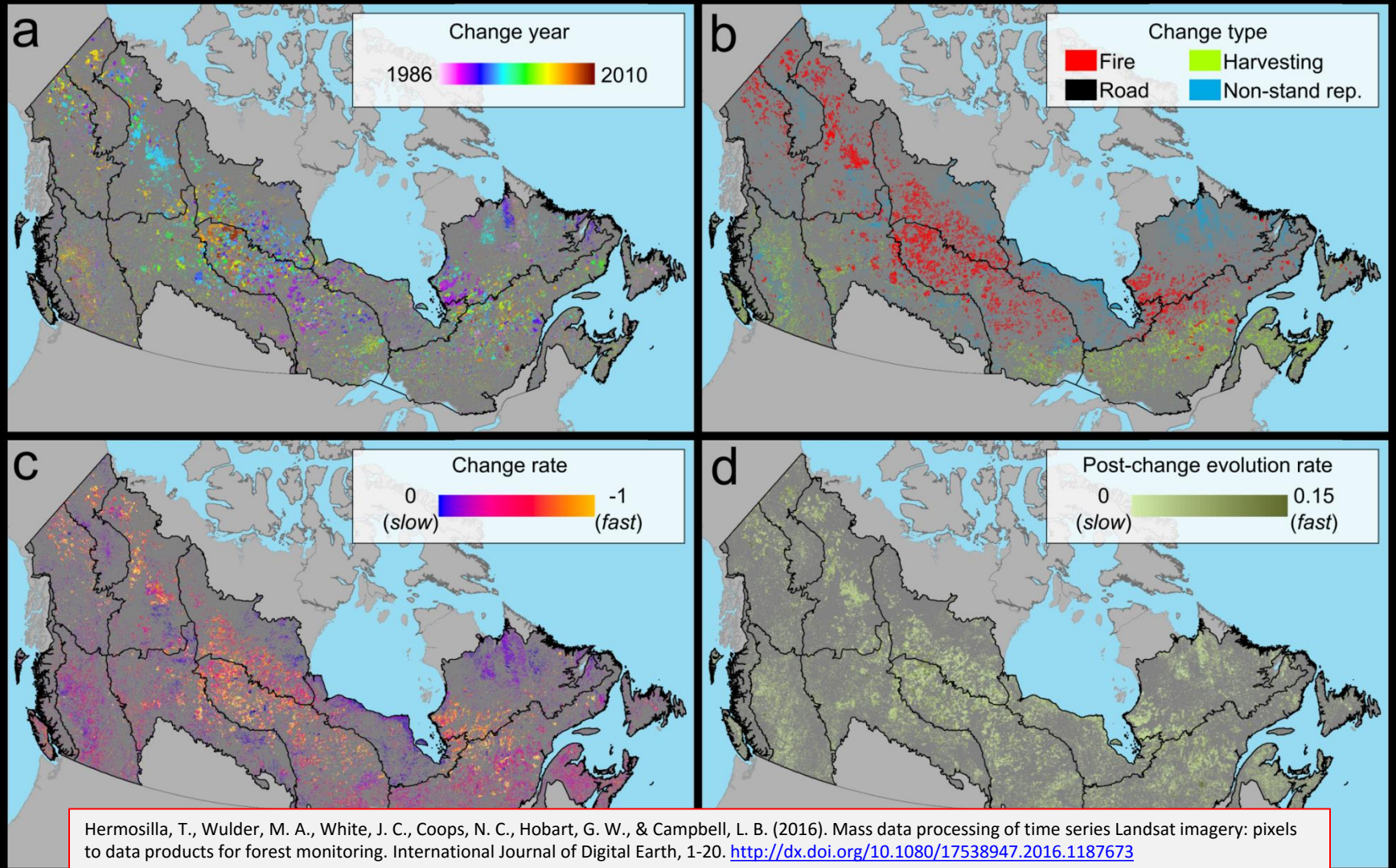


Image compositing assessment





Hermosilla, T., Wulder, M. A., White, J. C., Coops, N. C., Hobart, G. W., & Campbell, L. B. (2016). Mass data processing of time series Landsat imagery: pixels to data products for forest monitoring. International Journal of Digital Earth, 1-20. http://dx.doi.org/10.1080/17538947.2016.1187673

Change detection & attribution assessment

- Detection year **97% within ± 1 year**
- Change detection **89%**
- Change attribution **92%**
  - Fire **98%** (user), **93%** (producer)
  - Harvesting **88%** (user)**, 88%** (producer)

Following Olofsson et al. (2014)

Data processing

Local processing environment

Cluster computing environment

WESTGRID

9,600 cores available

Parallel processing

Cloud storage

Shared resource

Request of sources:
- Time
- Memory

Limited licenses

Adaptation of the scripts

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Mass data processing of time series Landsat imagery: pixels to data products for forest monitoring

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ABSTRACT

Free and open access to the Landsat archive has enabled the implementation of national and global terrestrial monitoring projects. Herein, we summarize a project characterizing the change history of Canada's forested ecosystems with a time series of data representing 1984–2012. Using the Composite2Change approach, we applied spectral

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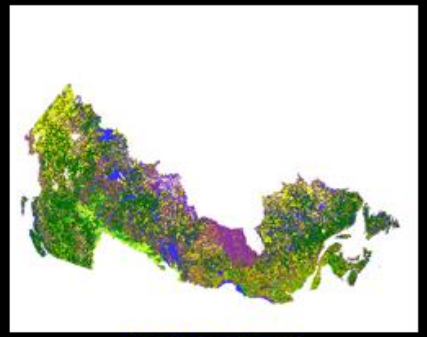
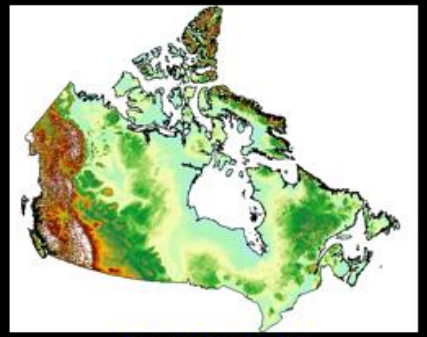
VLCE: Virtual Land-Cover Engine



EOSD 2000

Proxy composite 2000



ASTER DEM

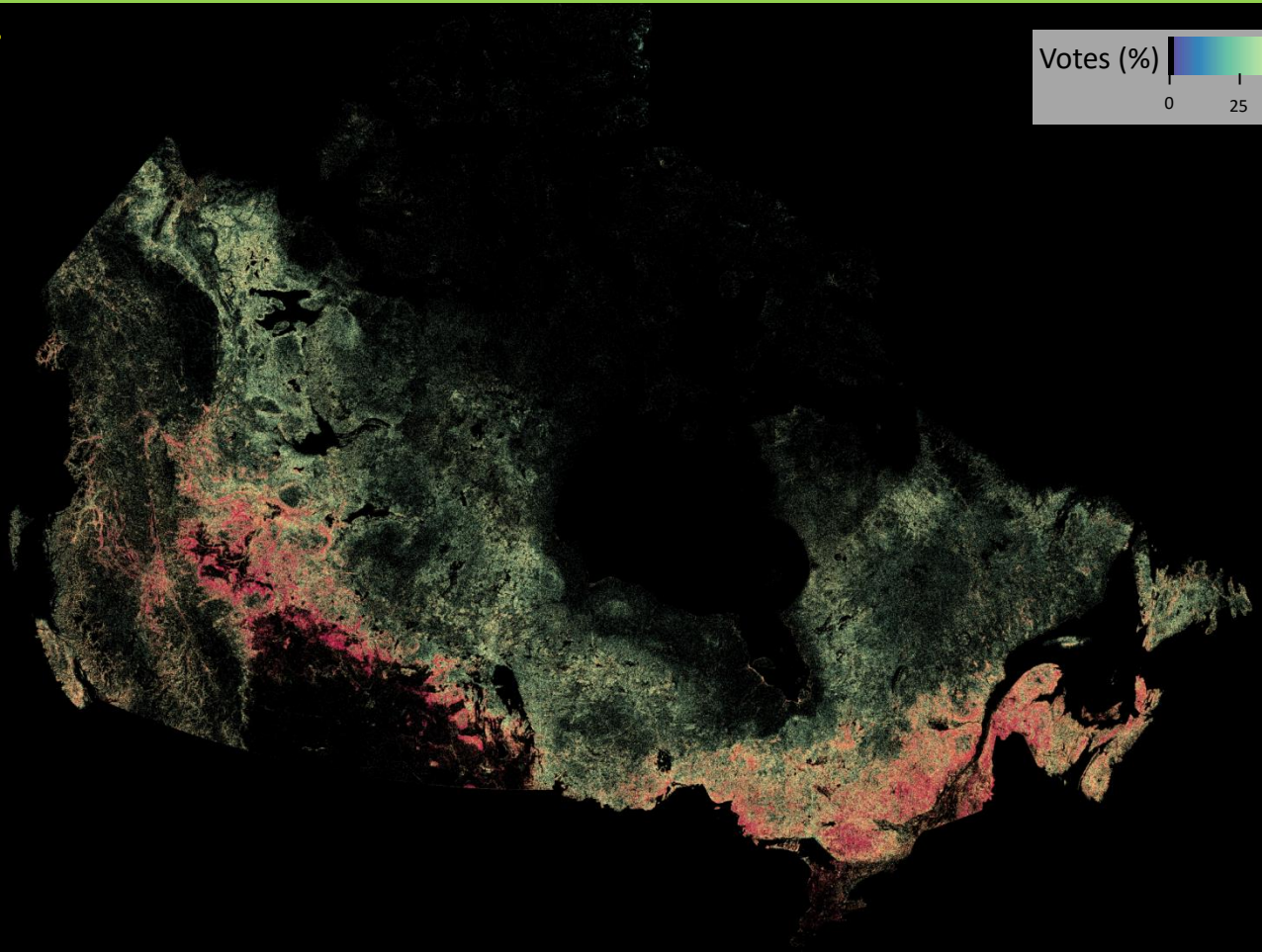
Classification system

Descriptive metrics

Random Forest Model

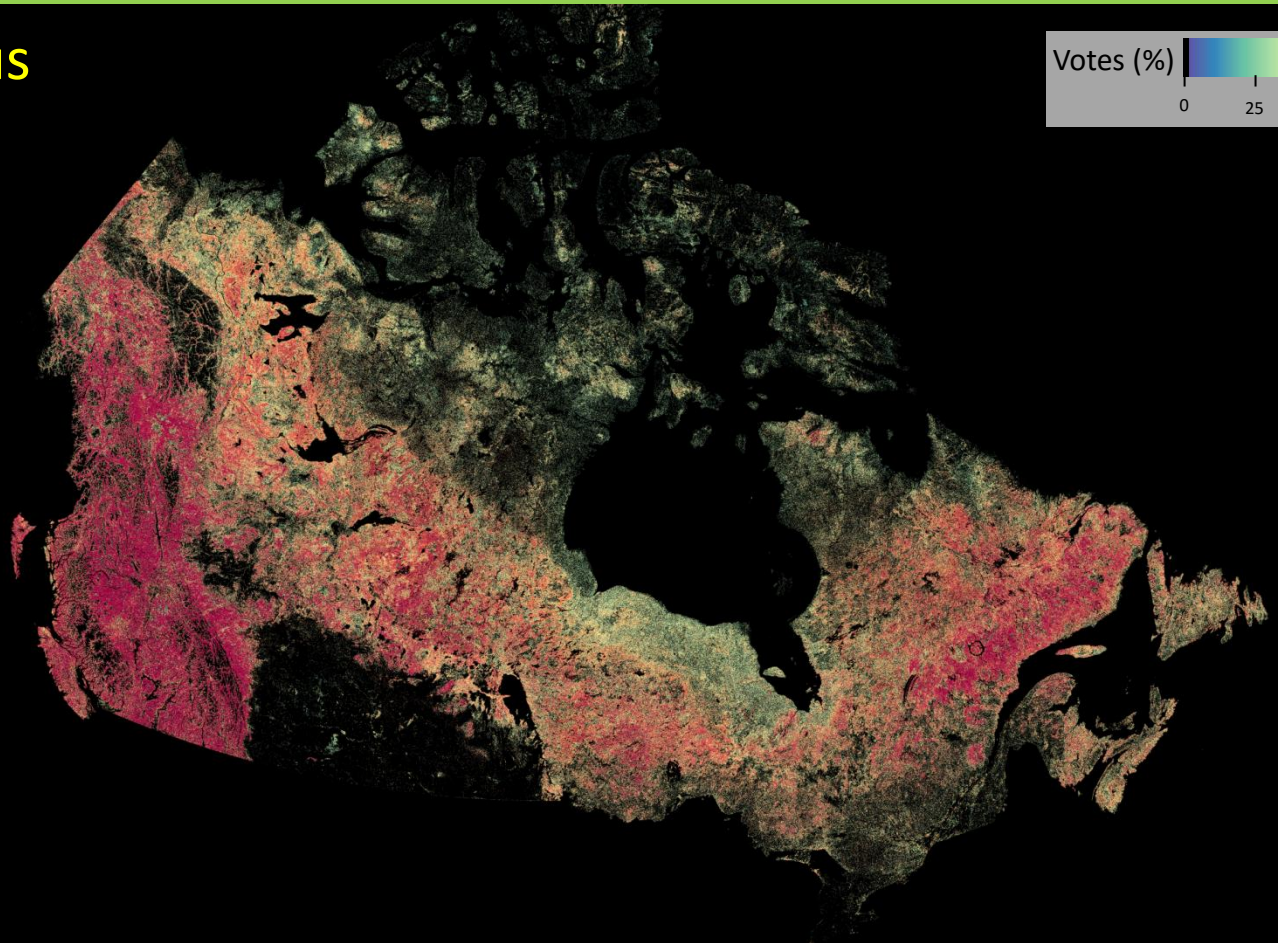
VLCE: Virtual Land-Cover Engine

Broadleaf likelihood



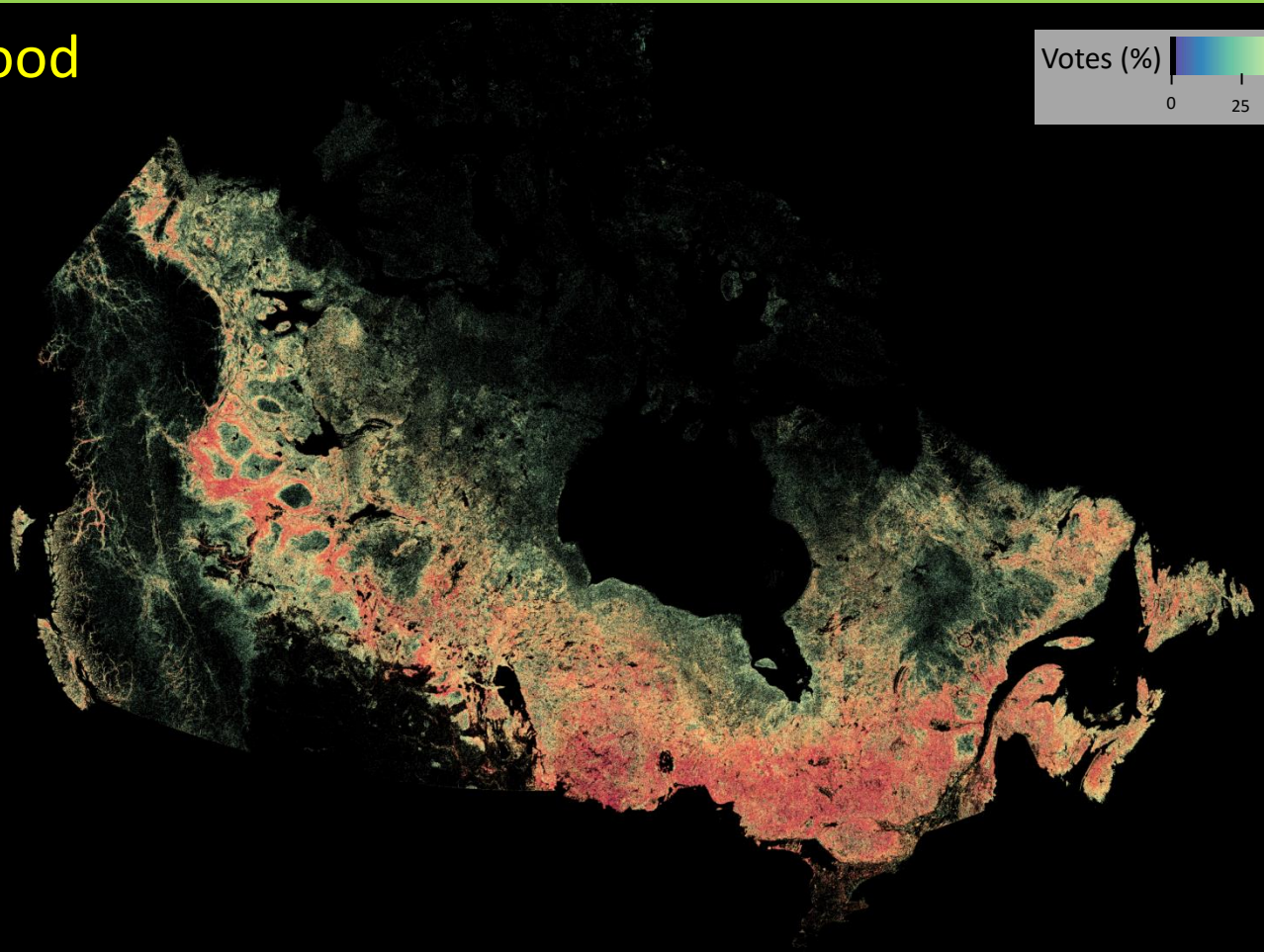
VLCE: Virtual Land-Cover Engine

Coniferous likelihood



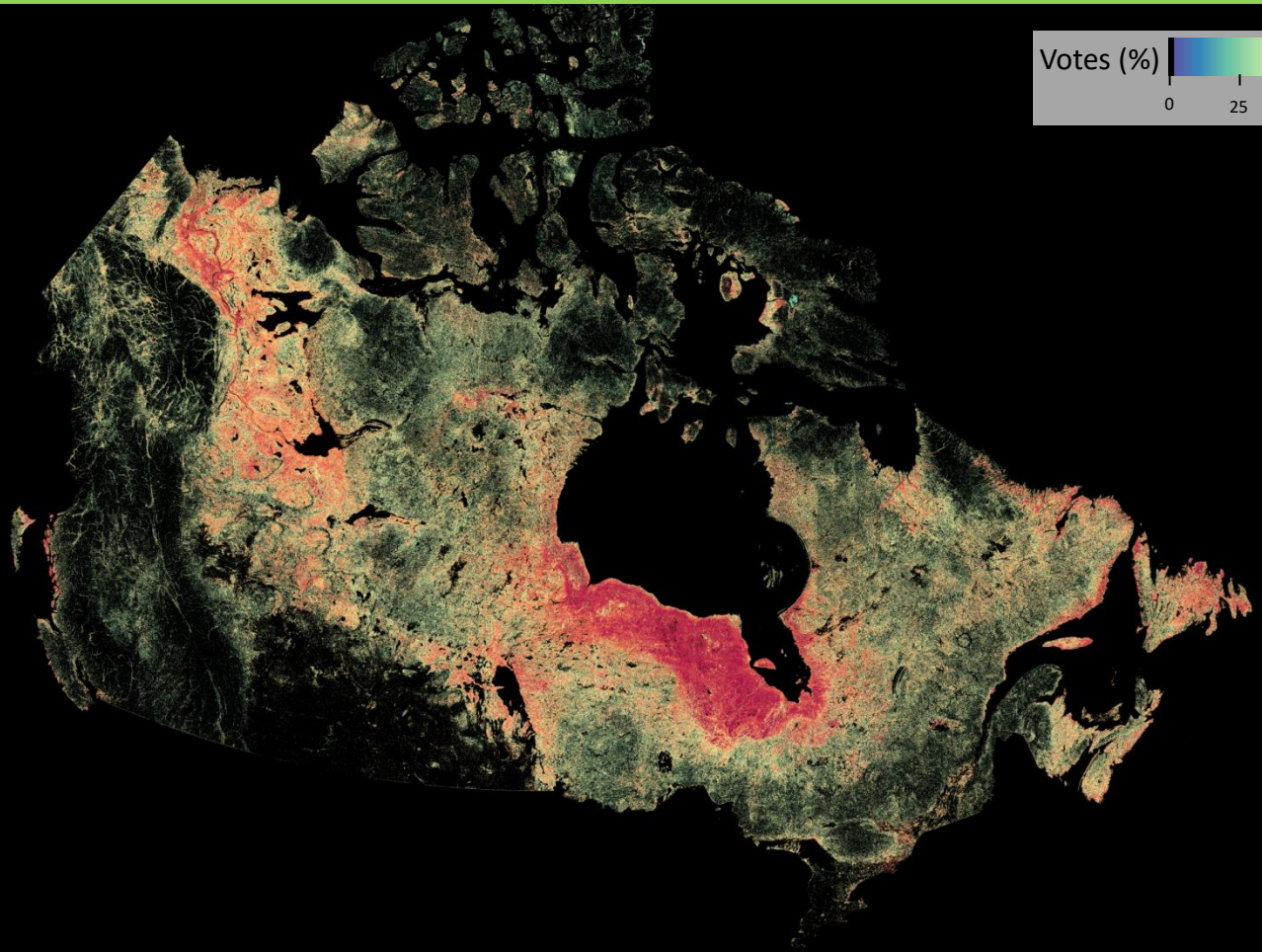
VLCE: Virtual Land-Cover Engine

Mixed Wood likelihood



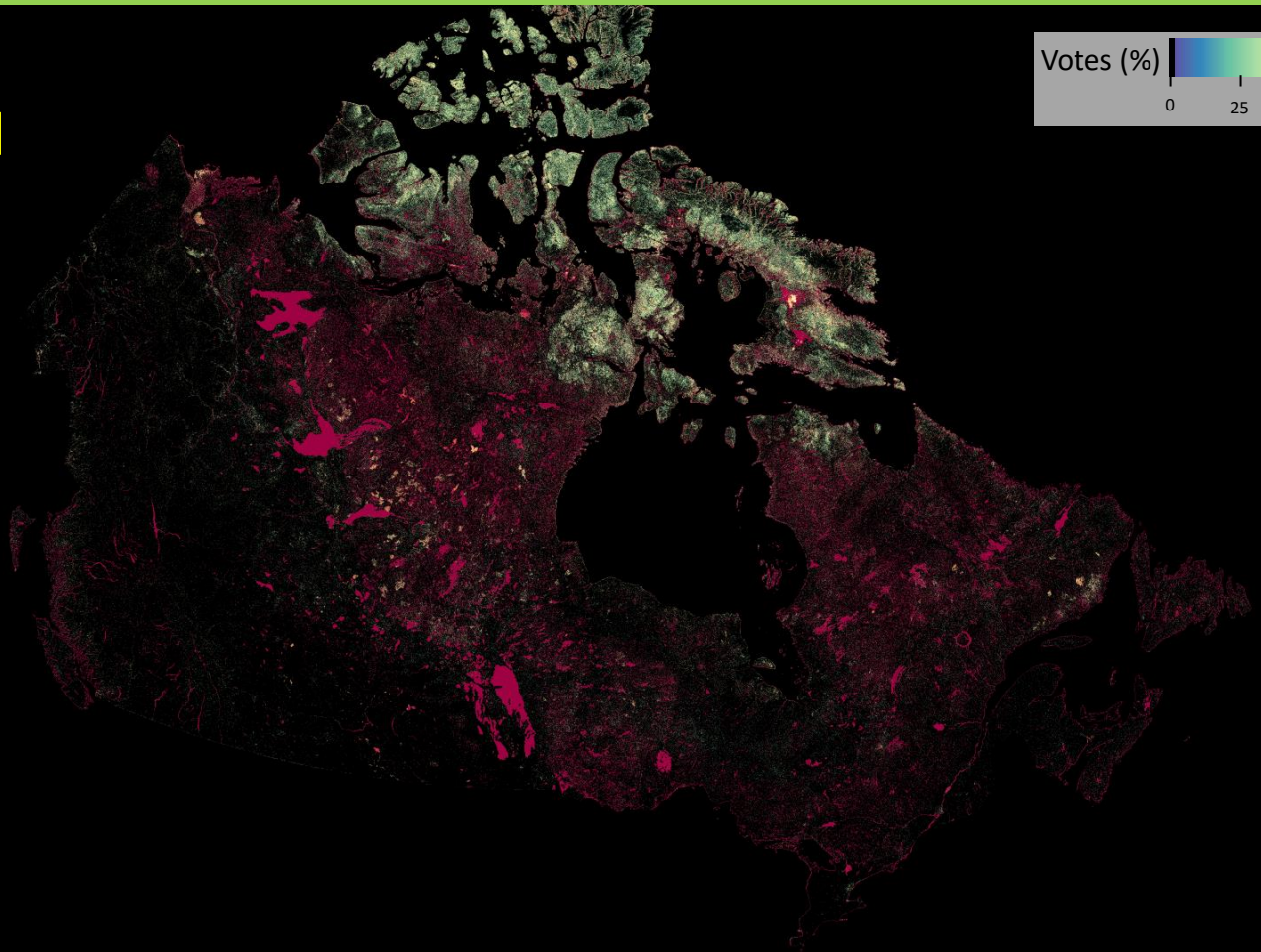
VLCE: Virtual Land-Cover Engine

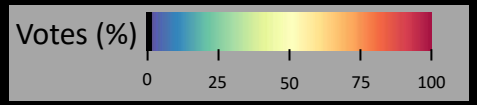
Wetlands likelihood



VLCE: Virtual Land-Cover Engine

Water likelihood





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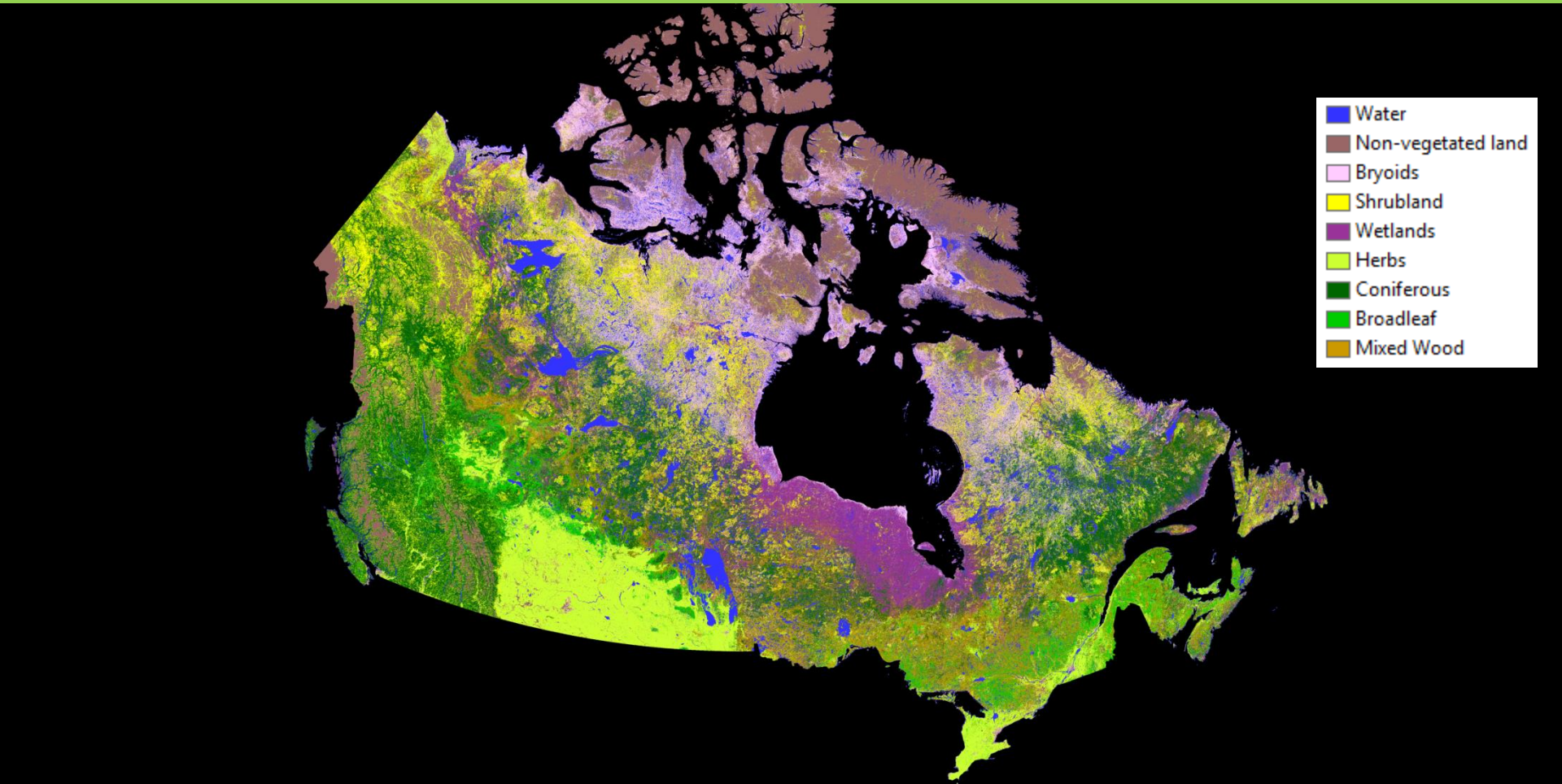

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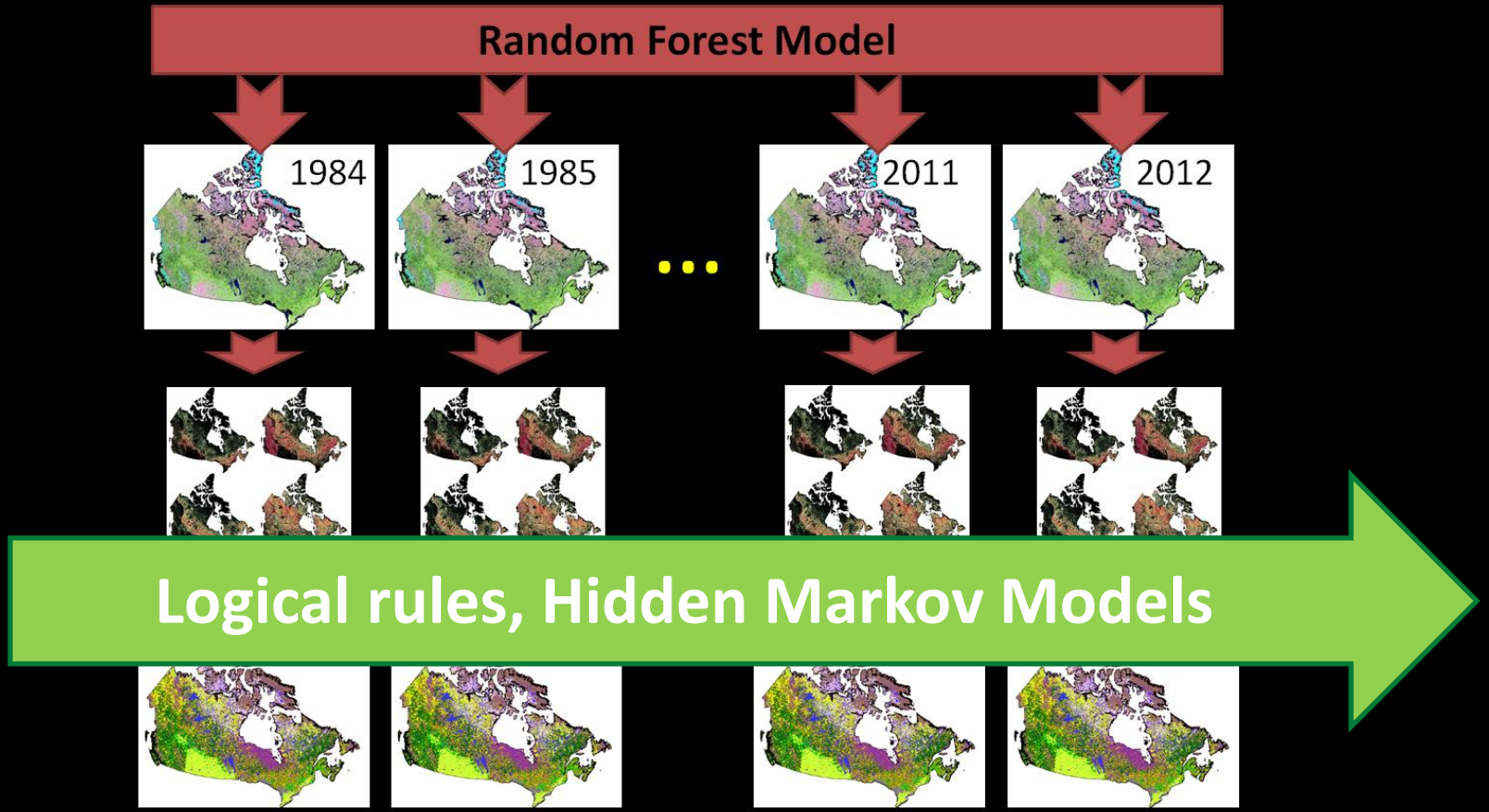

Thanks for your attention!

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Special acknowledge to

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