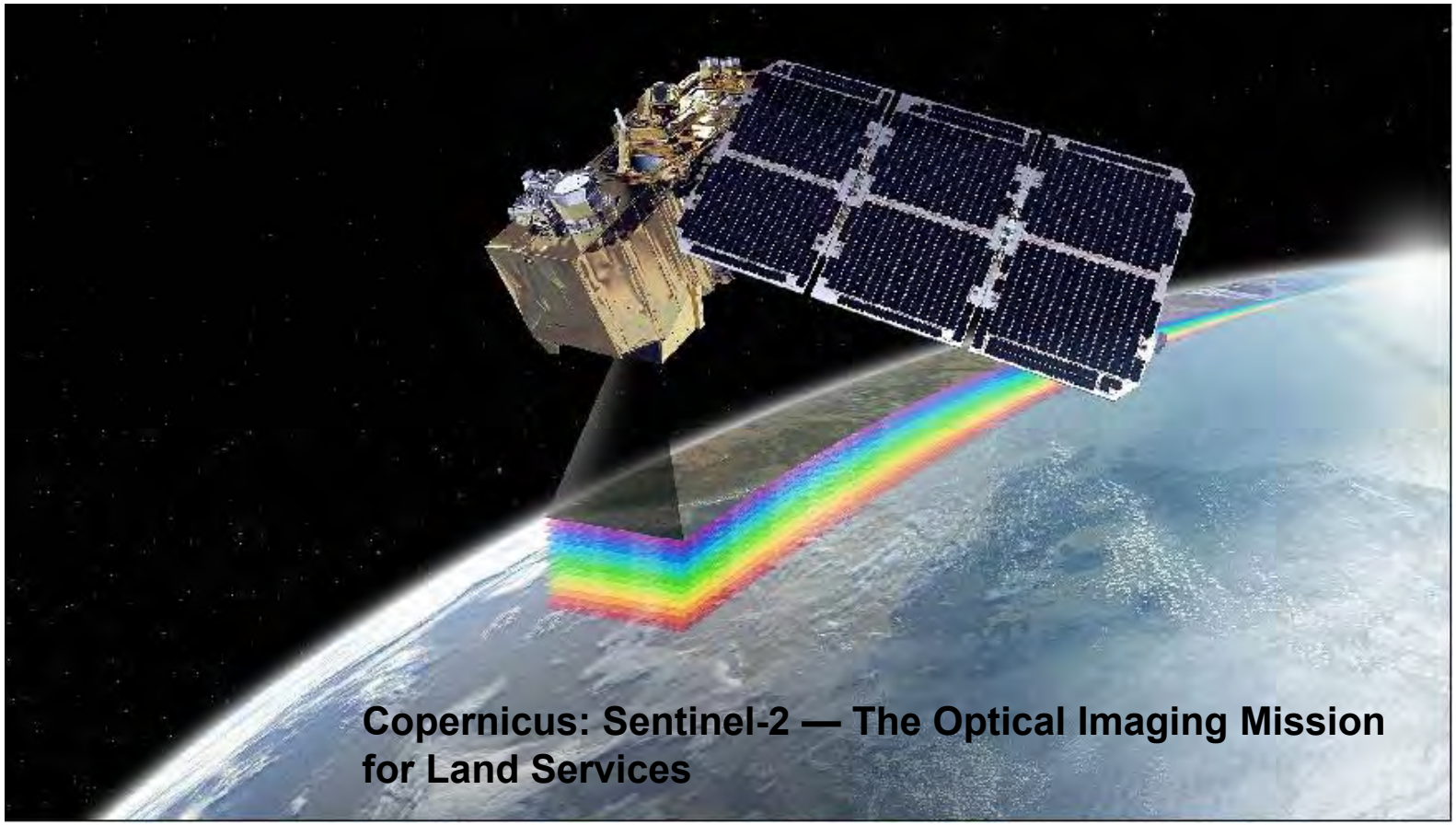
Practical Uses of Satellite Data in Forest Management

GCFF Conference April 2018



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Uses for Satellite Imagery

1. Introduction
2. Satellite imagery and forest fire management
3. Satellite imagery and stand mapping/ Geographic Information System (GIS)
4. Satellite imagery and crop performance / forest health.
5. Summary
6. Useful Websites

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1. Introduction

Positives

- **Satellite data is becoming more accurate and cheaper (free).**
- **Coverage (number of satellites) increasing all the time.**

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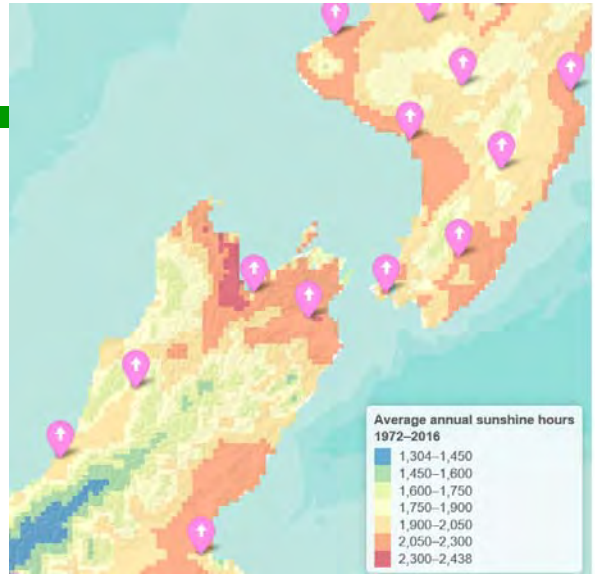
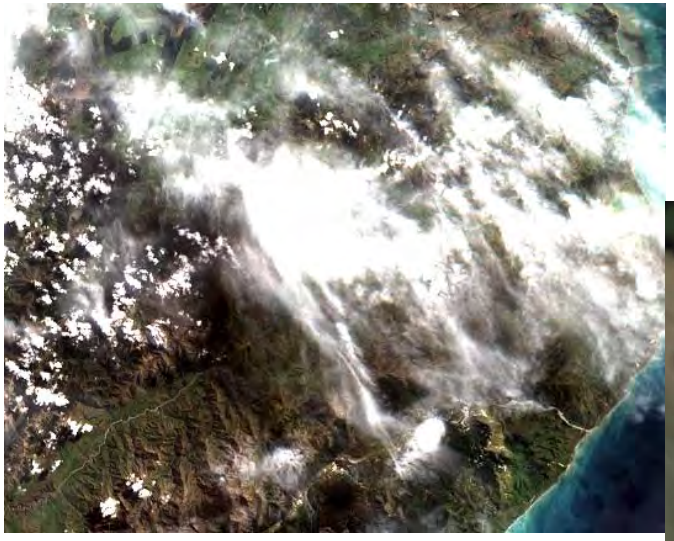
1. Introduction



https://statisticsnz.shinyapps.io/sunshine_hours/

Limitations

- Cloud can be an issue.
- Resolution can be quite coarse.
- Sun angle/ shaded southern aspect can be a problem especially in winter months



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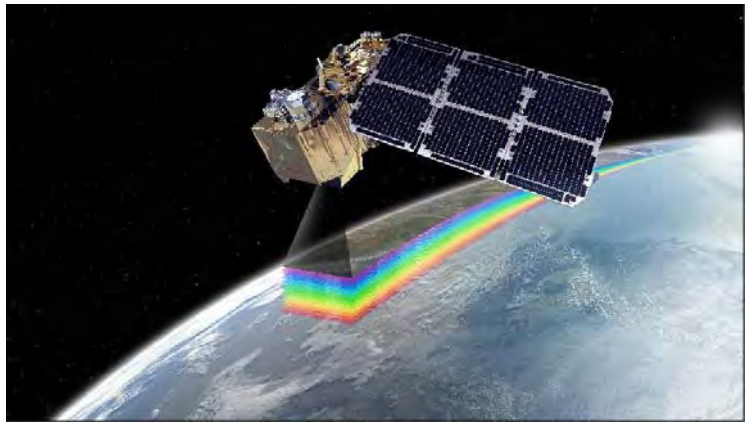
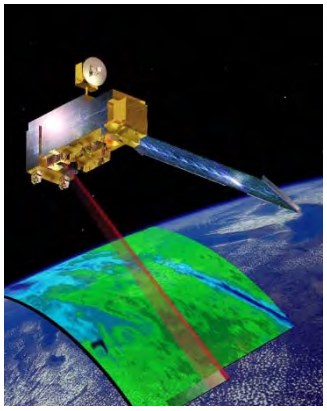
1. Introduction



Sentinel 2 (ESA)

- Multi-spectral data with 13 bands
- Revisiting every 5 days under the same viewing angles.
- Spatial resolution of 10-60 m
- Free and open data policy



MODIS (NASA) - Climate change and fire

- The moderate-resolution imaging spectroradiometer (MODIS)
- Launched into Earth orbit by NASA in 1999, and in 2002.

VIIRS (NASA) - Climate change and fire

- Visible Infrared Imaging Radiometer Suite (VIIRS)

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2.1 Smoke plume e.g. Port Hills fire

ESA's imaging satellite Sentinel 2A.

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2.2 Fire extent (Initial)

http://imagery.landcareresearch.co.nz/

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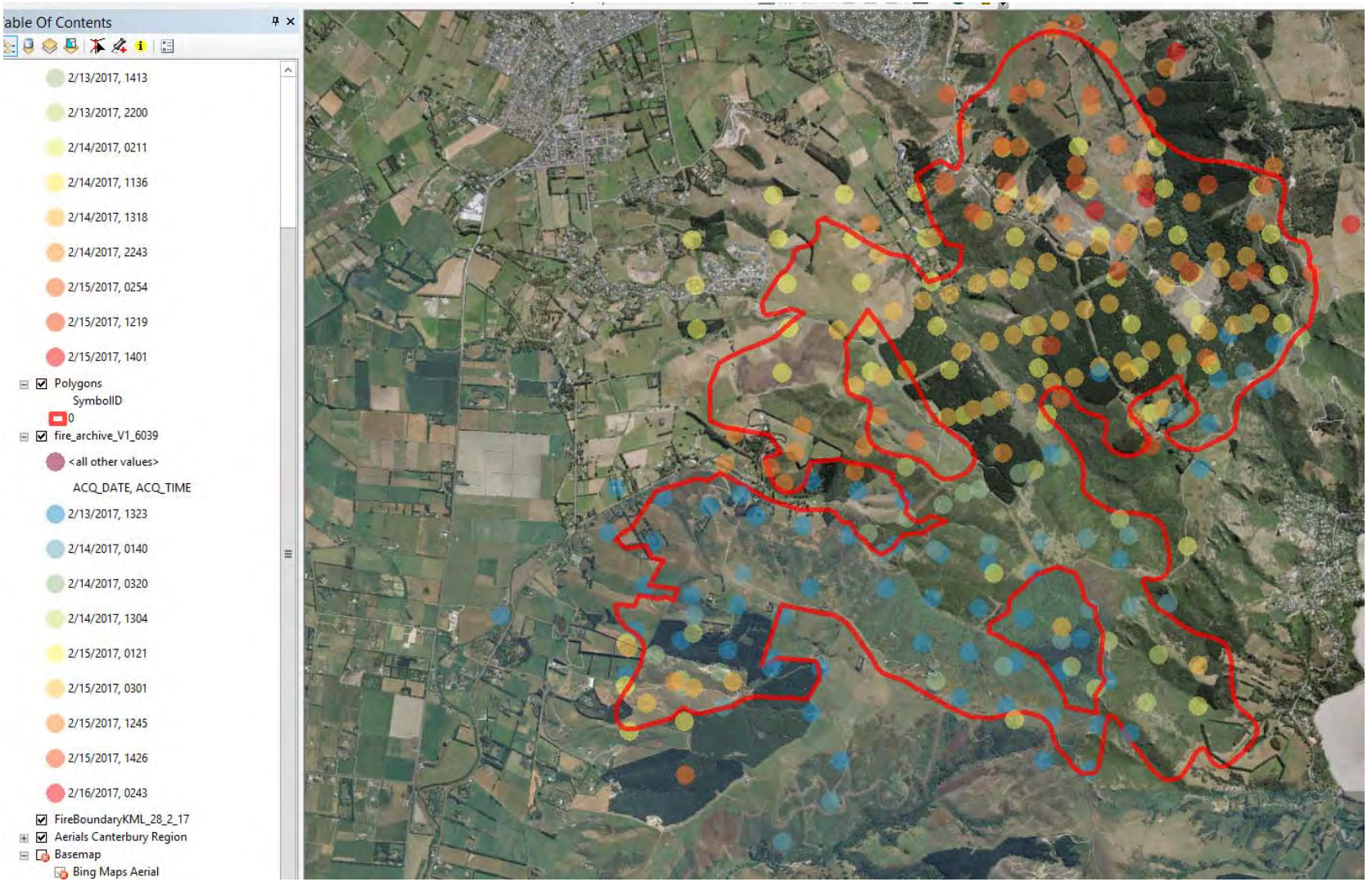
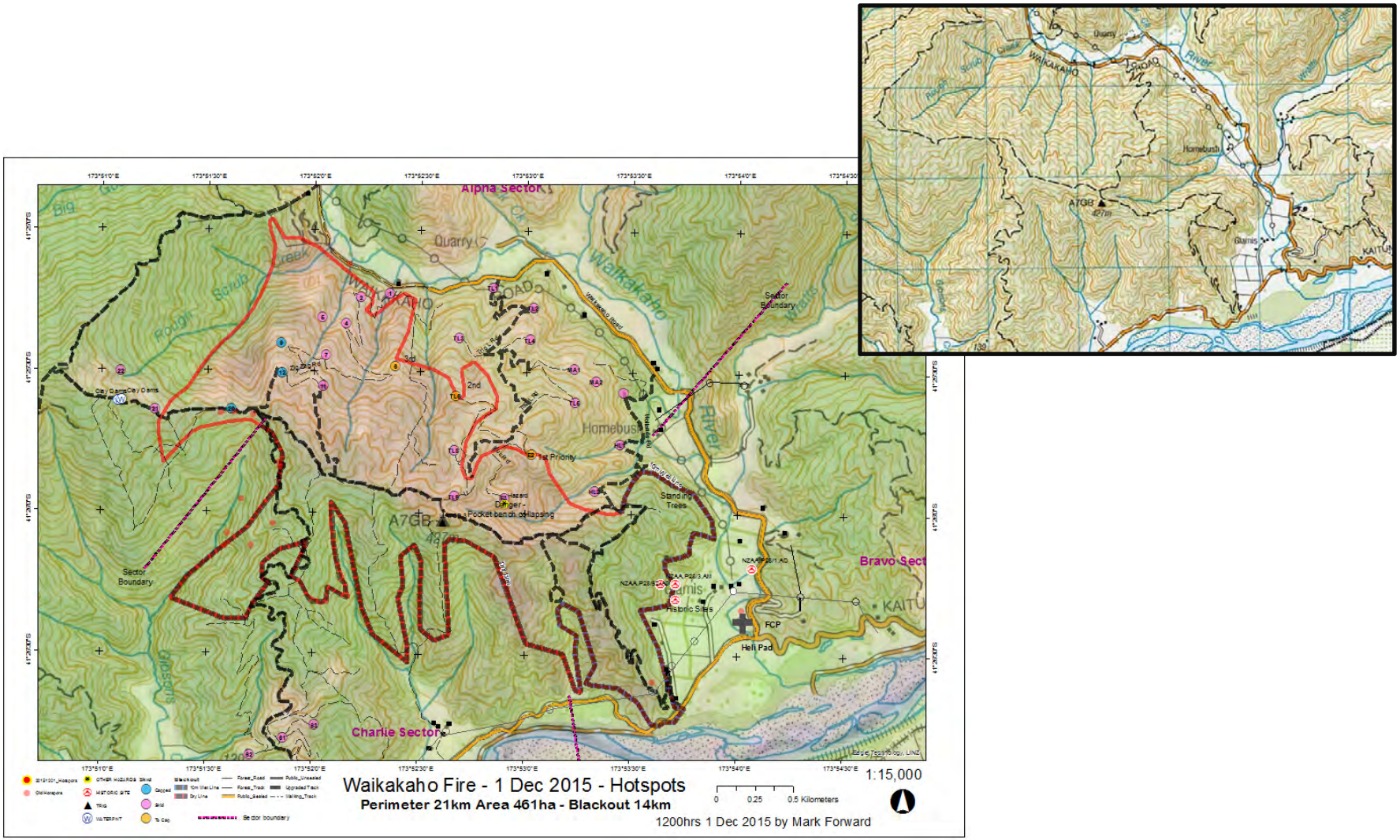
2.3 Burn progression – e.g. Port Hills fire – MODIS/VIIRS



https://earthdata.nasa.gov/earth-observation-data/near-real-time/firms/active-fire-data

2.4 Confirm vegetation fuel types (Firefighting/ Prometheus)



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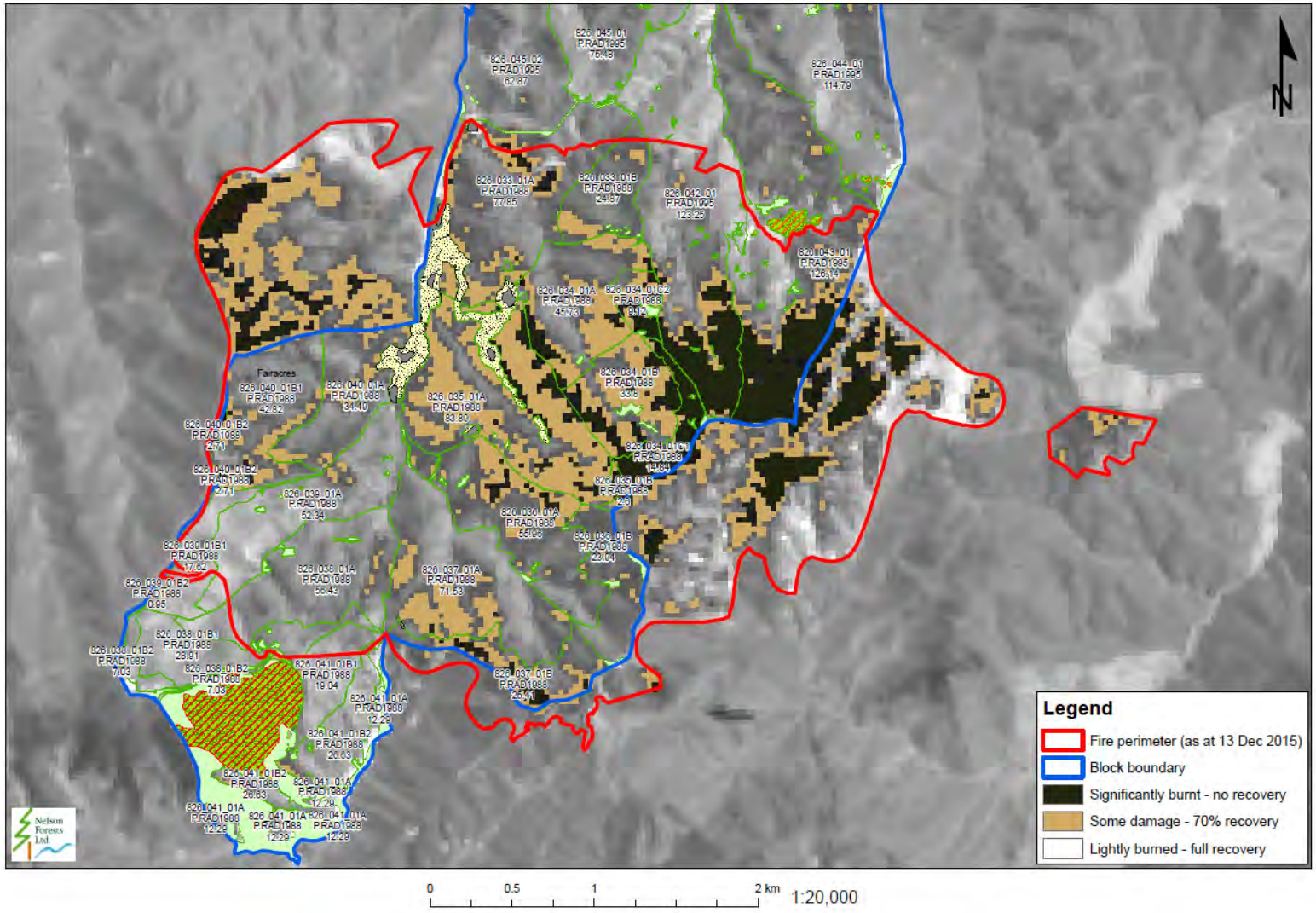
2.5 Looking at burn intensity, damage to crop

Parson's Road Fire - Fairacres Block (Dec 2015)



Jasmine Snowsill, Nelson Forests Limited

2.6 Hot Skids =>Skid fires

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2.6 Hot Skids =>Skid fires – Satellite email alerts - Cont

Tue 23/01/2018 5:06 PM

NASA FIRMS <noreply@modx.nascom.nasa.gov>

FIRMS Rapid Alert Id 17526, modis-c6 (Mark)

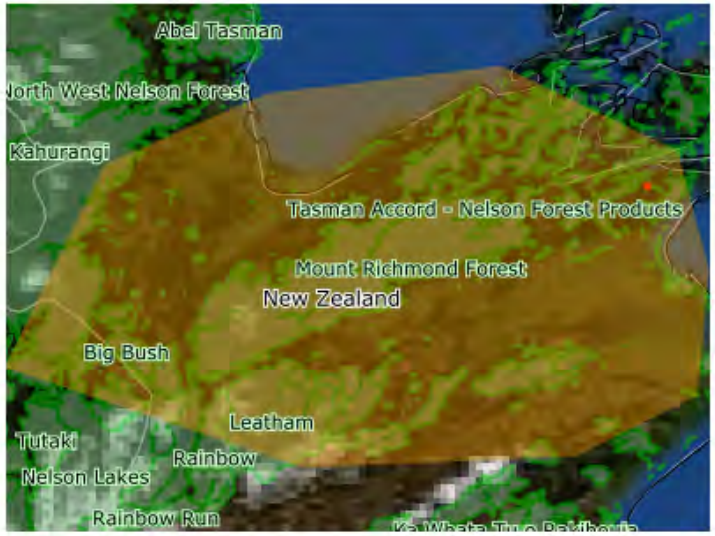
To Mark Forward

If there are problems with how this message is displayed, click here to view it in a web browser.

R_FirePoints_17526_180122230543_modis-c6.csv
560 bytes

Bing Maps Unsubscribe + Get more apps

(*Custom Polygon*)



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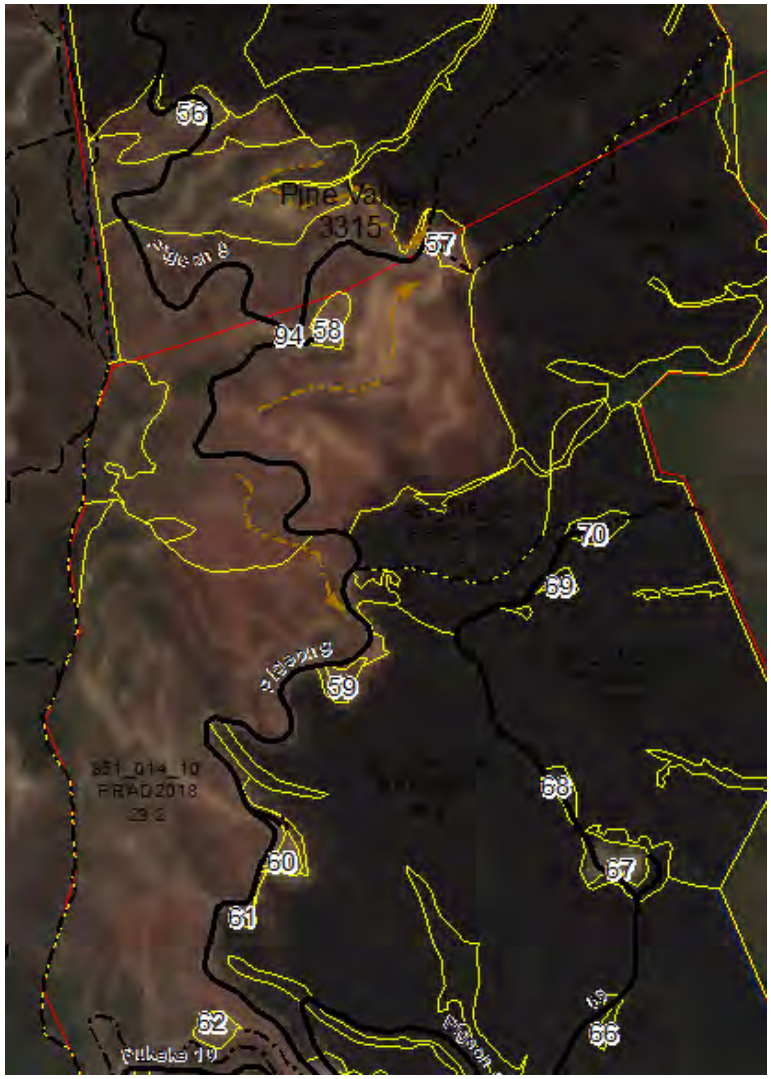
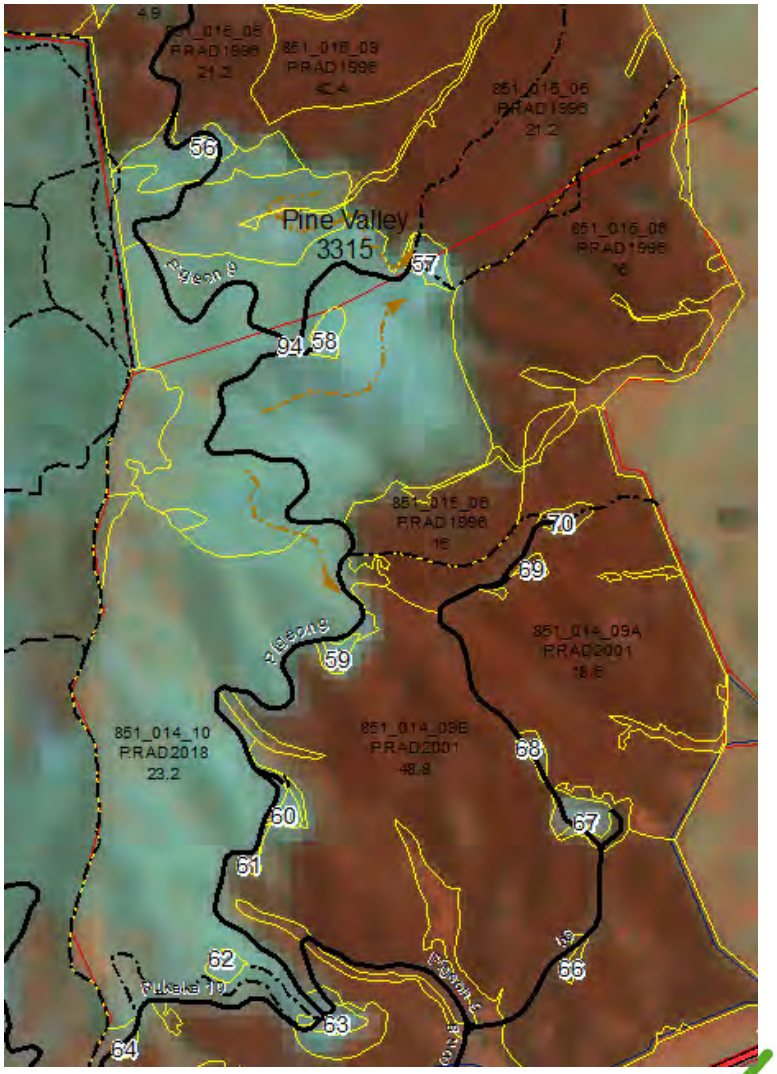
3.1 Cutover Mapping

1. **Cutover Mapping -** Resolution of free weekly (assuming cloud free) Sentinel imagery is OK for approximate cutover mapping (15m x 15m pixel), when higher resolution photography (< 1m x 1m) isn't available.



RGB



Thermal Infrared
(Bands 8,11,12)

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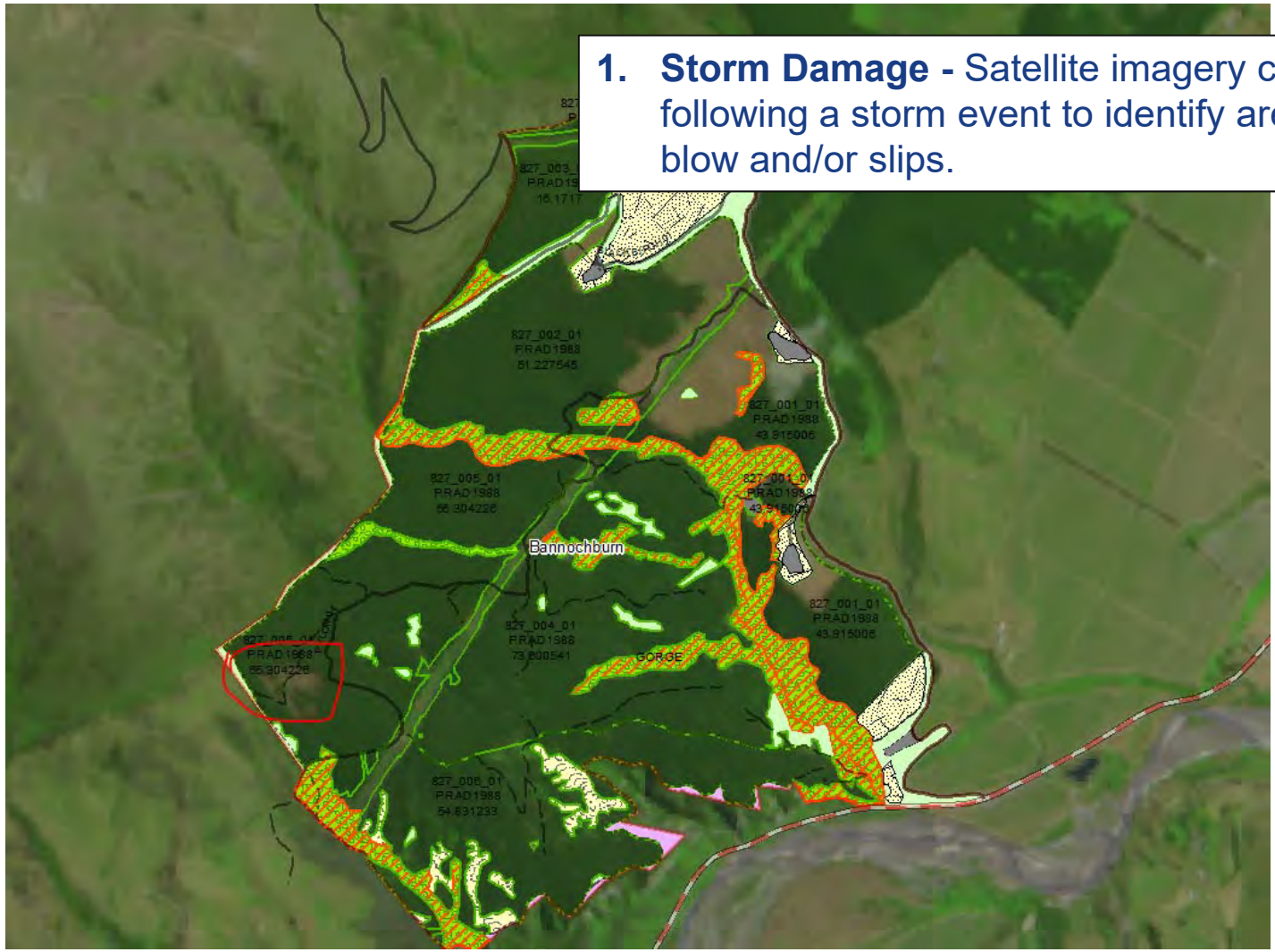
3.2 Storm Damage - Windblow



1. **Storm Damage -** Satellite imagery can be useful following a storm event to identify areas of wind blow and/or slips.

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RGB

Thermal Infrared
(Bands 8,11,12)

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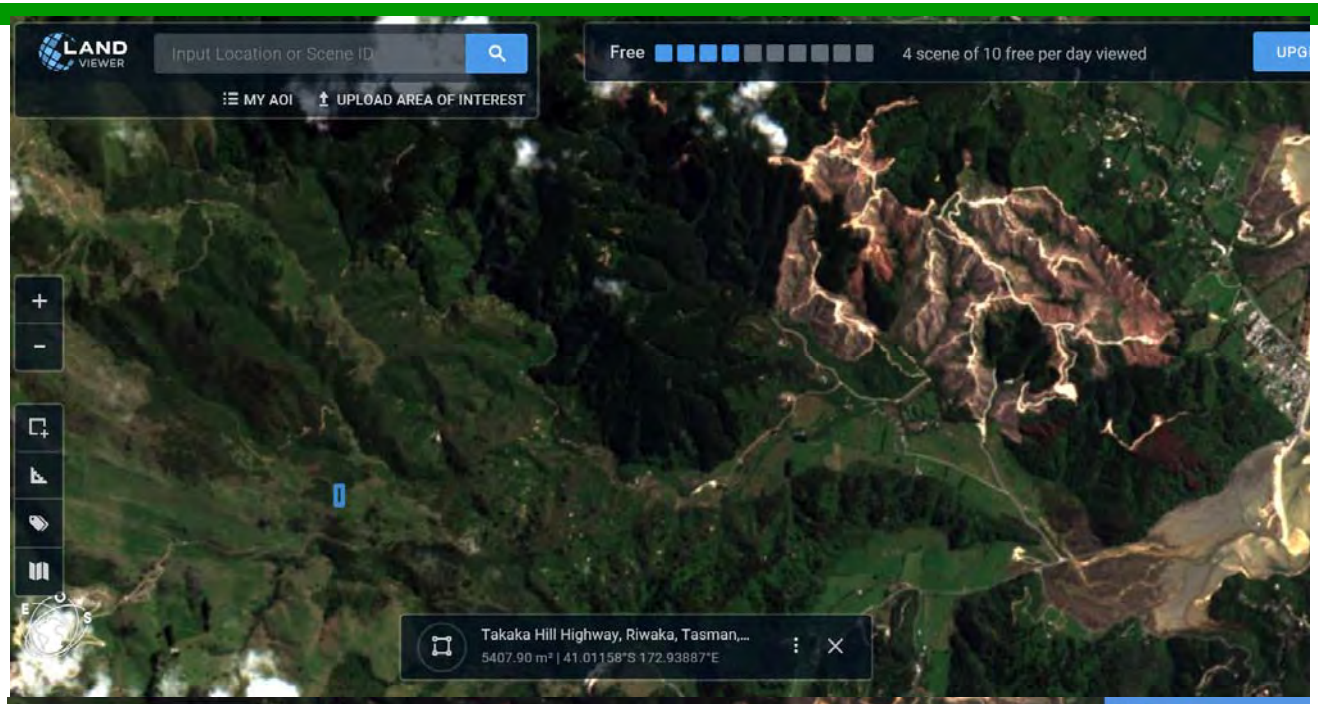
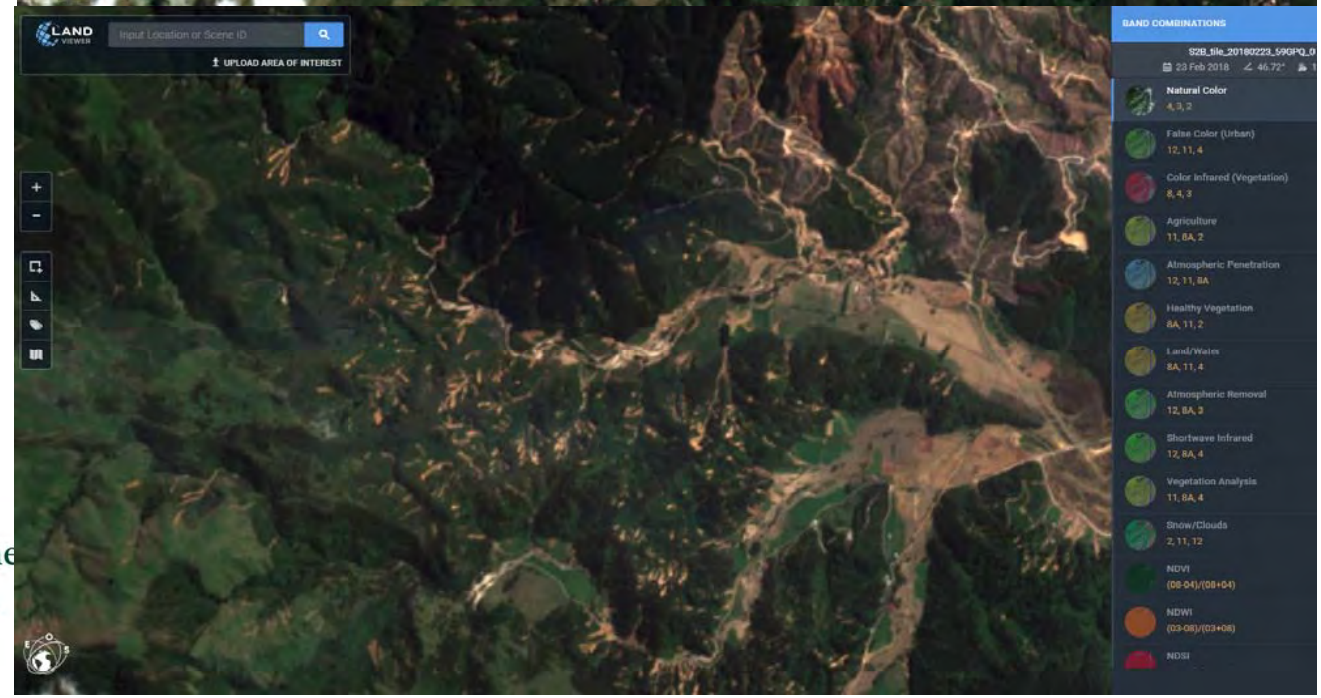
3.2 Storm Damage – Slips, Debris flows

Before

After





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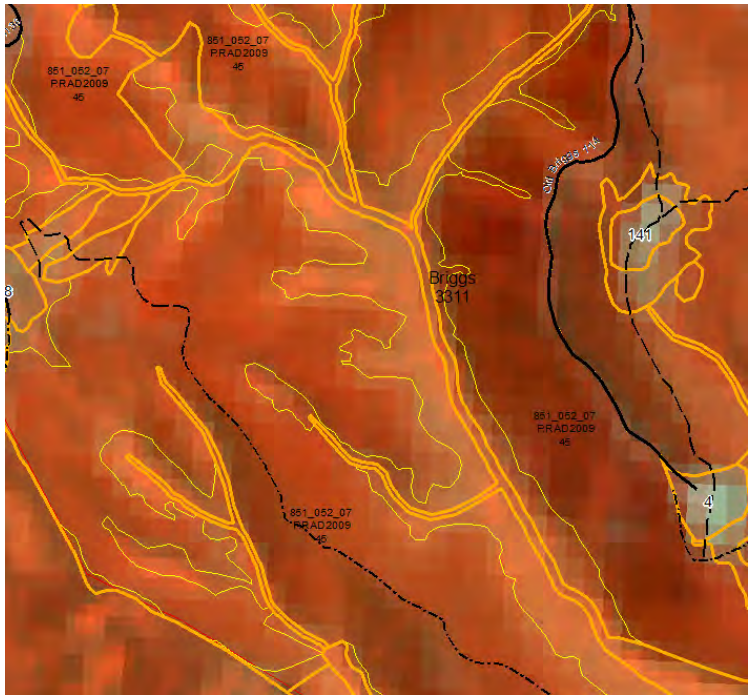
3.3 Stand Remapping

Stand Mapping - Satellite imagery can be used to identify areas that may need remapping (e.g. unstocked gaps, boundary adjustments etc)



Thermal Infrared – old layer and remapped layer

Orthophoto – (old stand boundary)

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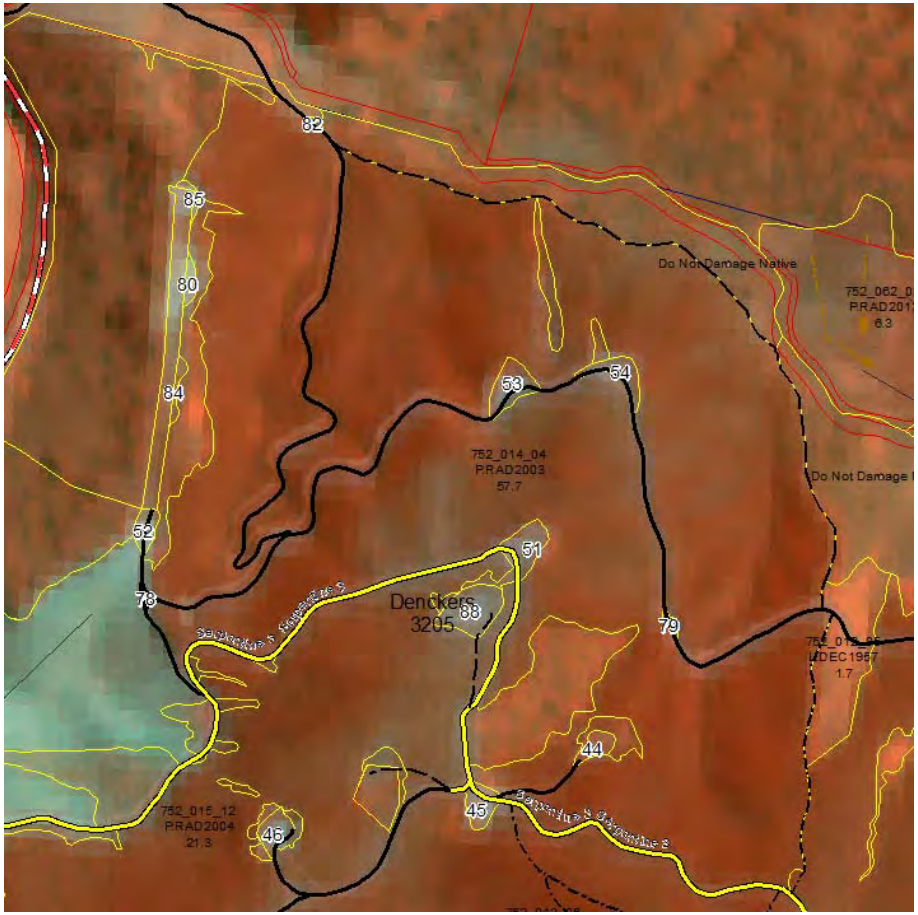
4.1 Crop Performance

Thermal Infrared – measuring vegetation stress and evapotranspiration - Exploring the use thermal infrared (by age class) to identify areas that are underperforming. Then trouble shoot why they may be underperforming – establishment, nutrition, needle cast etc…..

Google Image



Sentinel Imagery Bands 8,11,12

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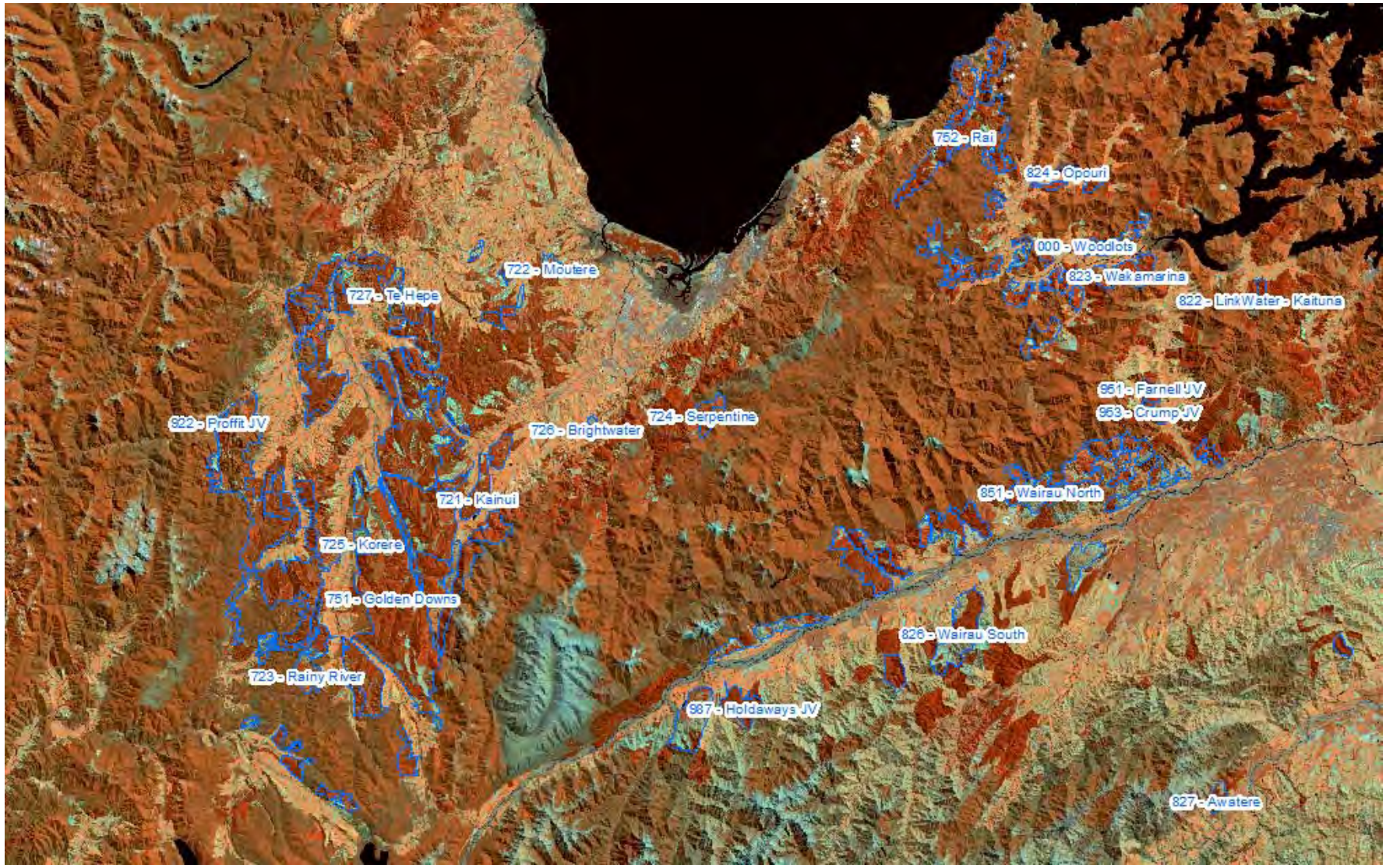
4.1 Crop Performance



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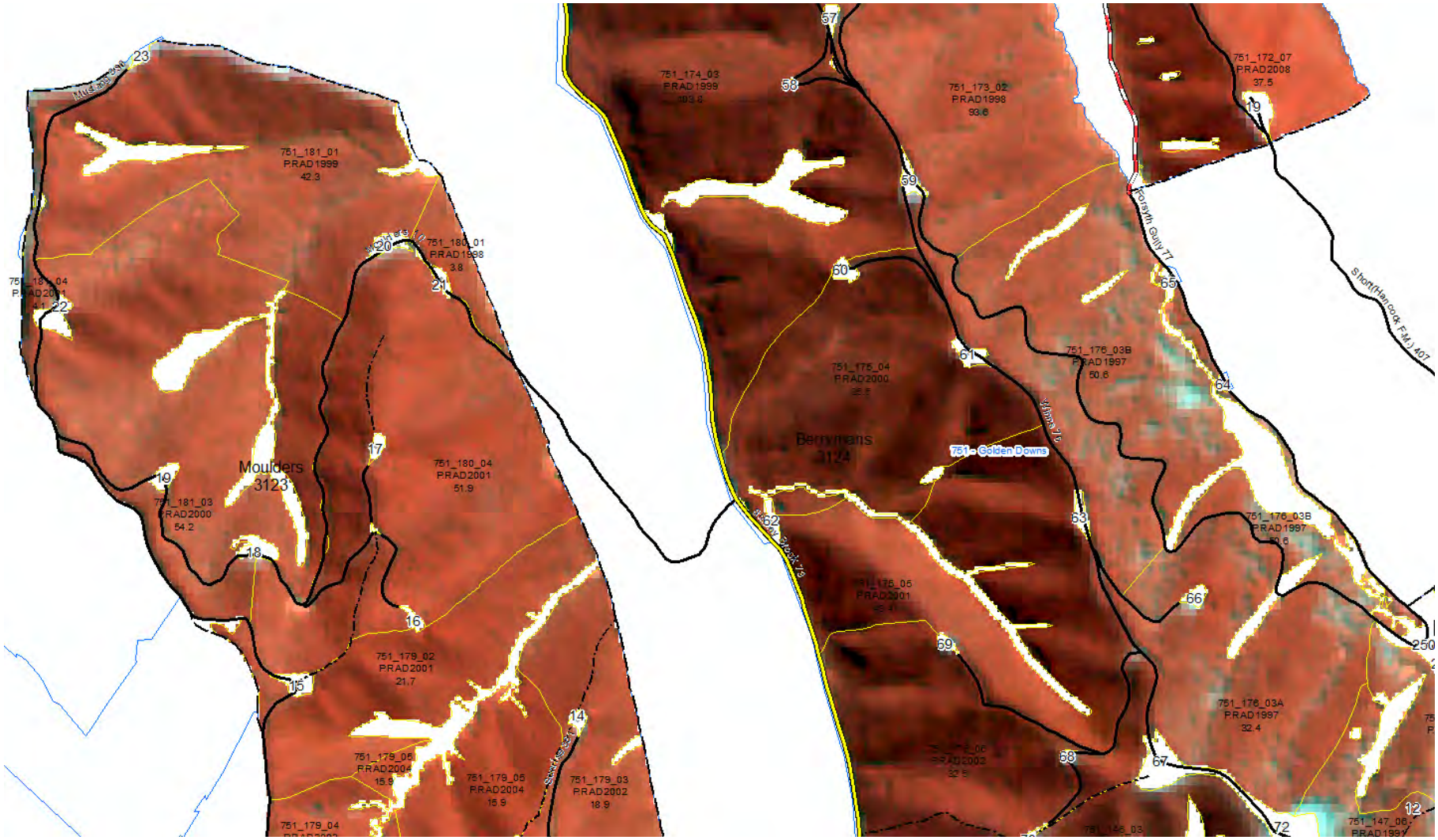
4.1 Crop Performance



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4.1 Crop Performance

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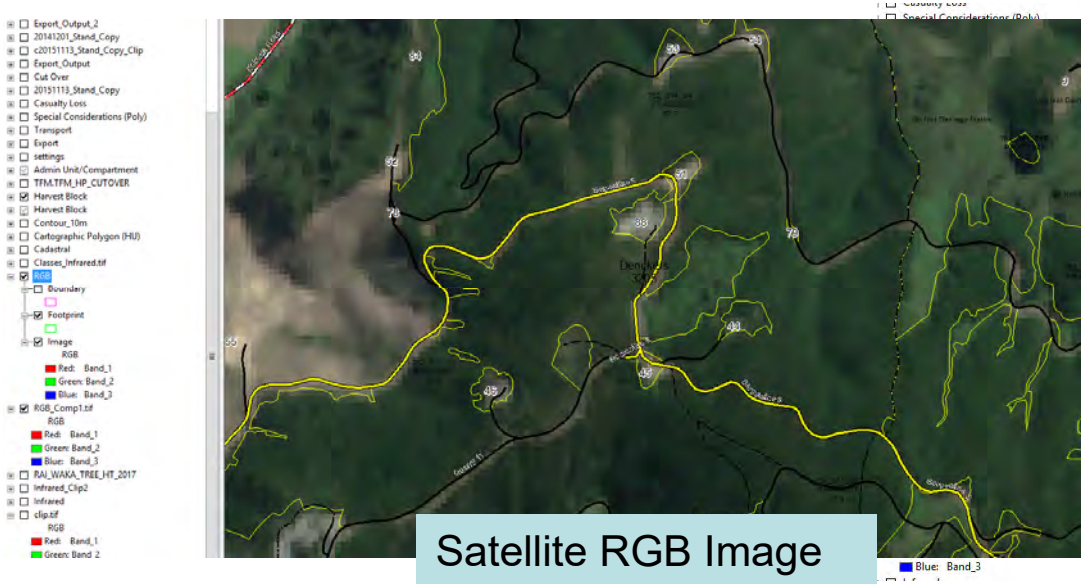
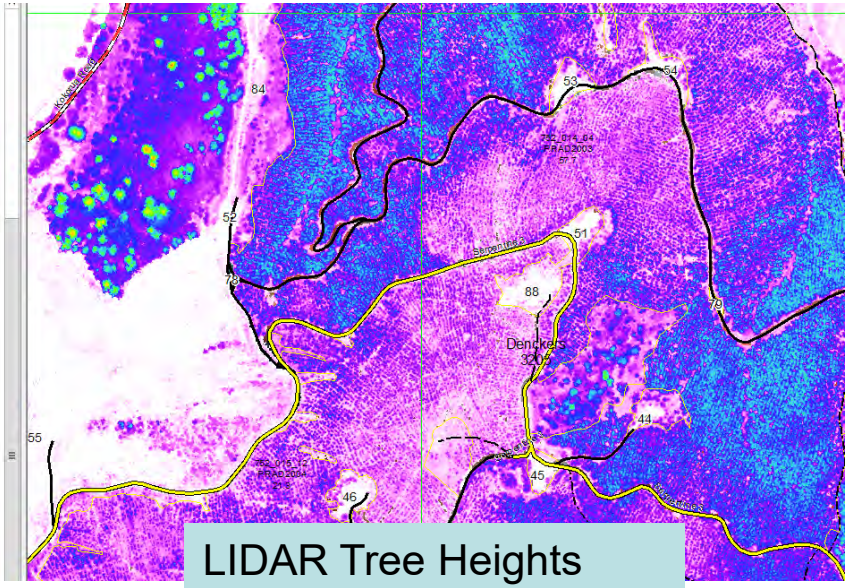
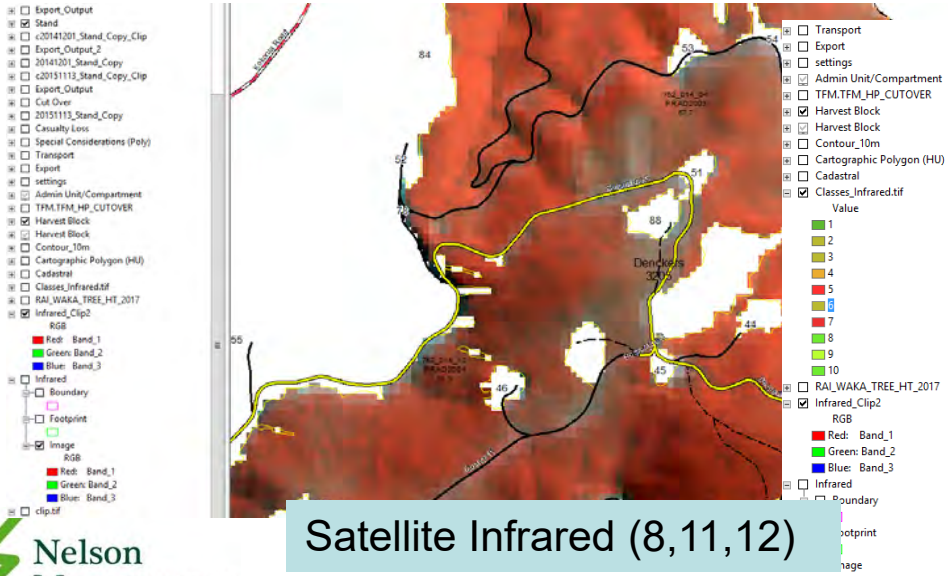


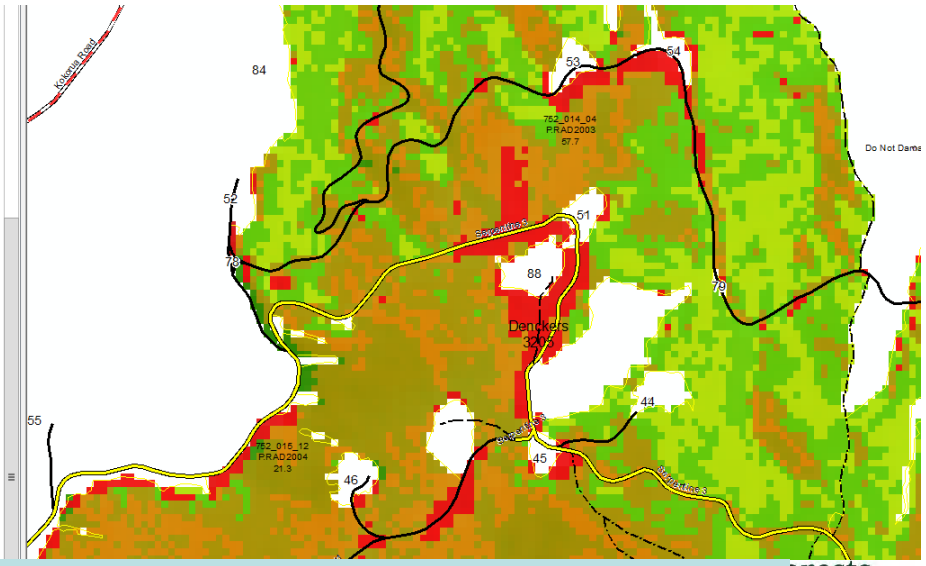
Satellite RGB Image



LIDAR Tree Heights



Satellite Infrared (8,11,12)



Satellite Based Image Classification from Infrared image

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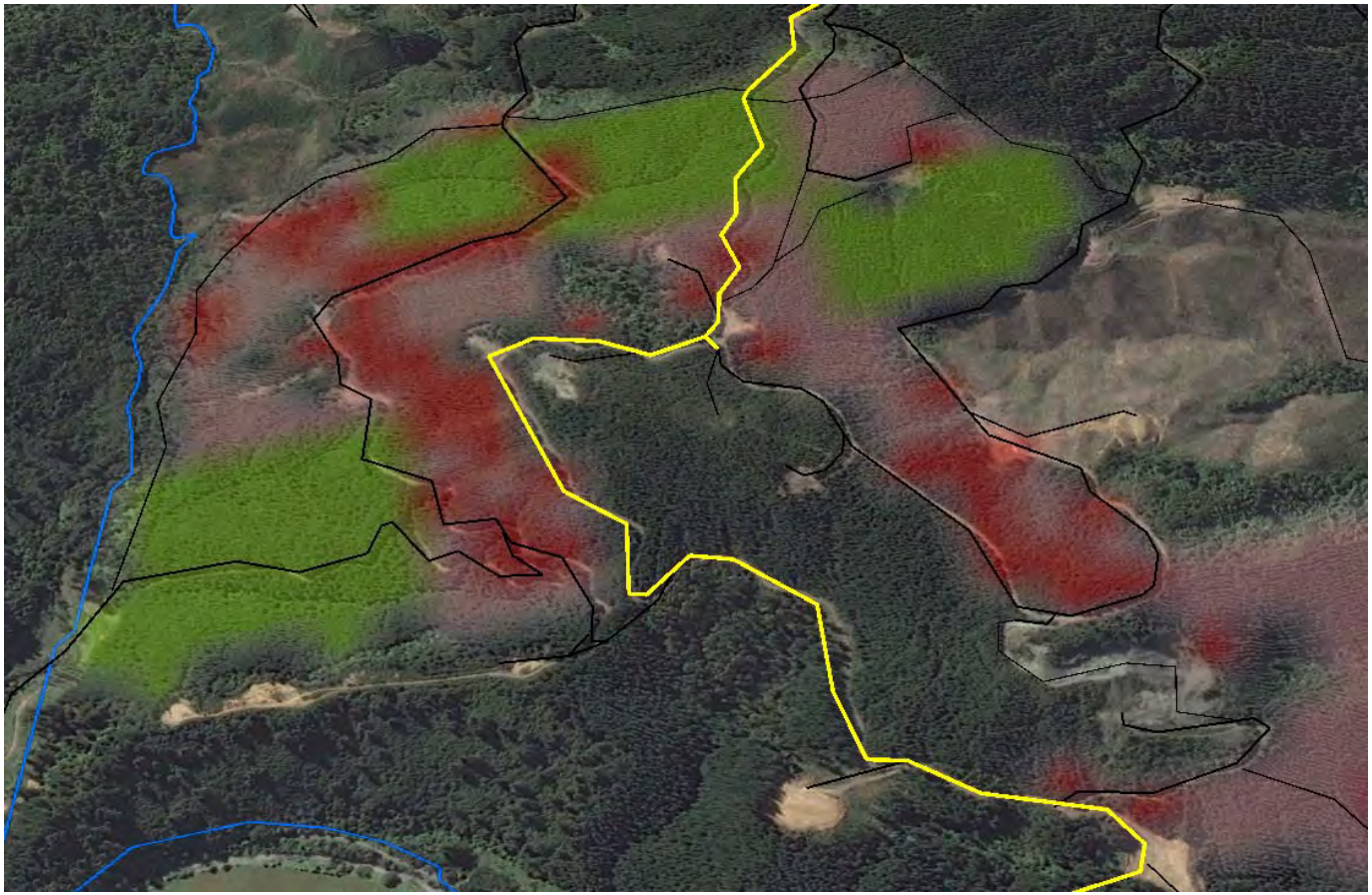
4.1 Crop Performance



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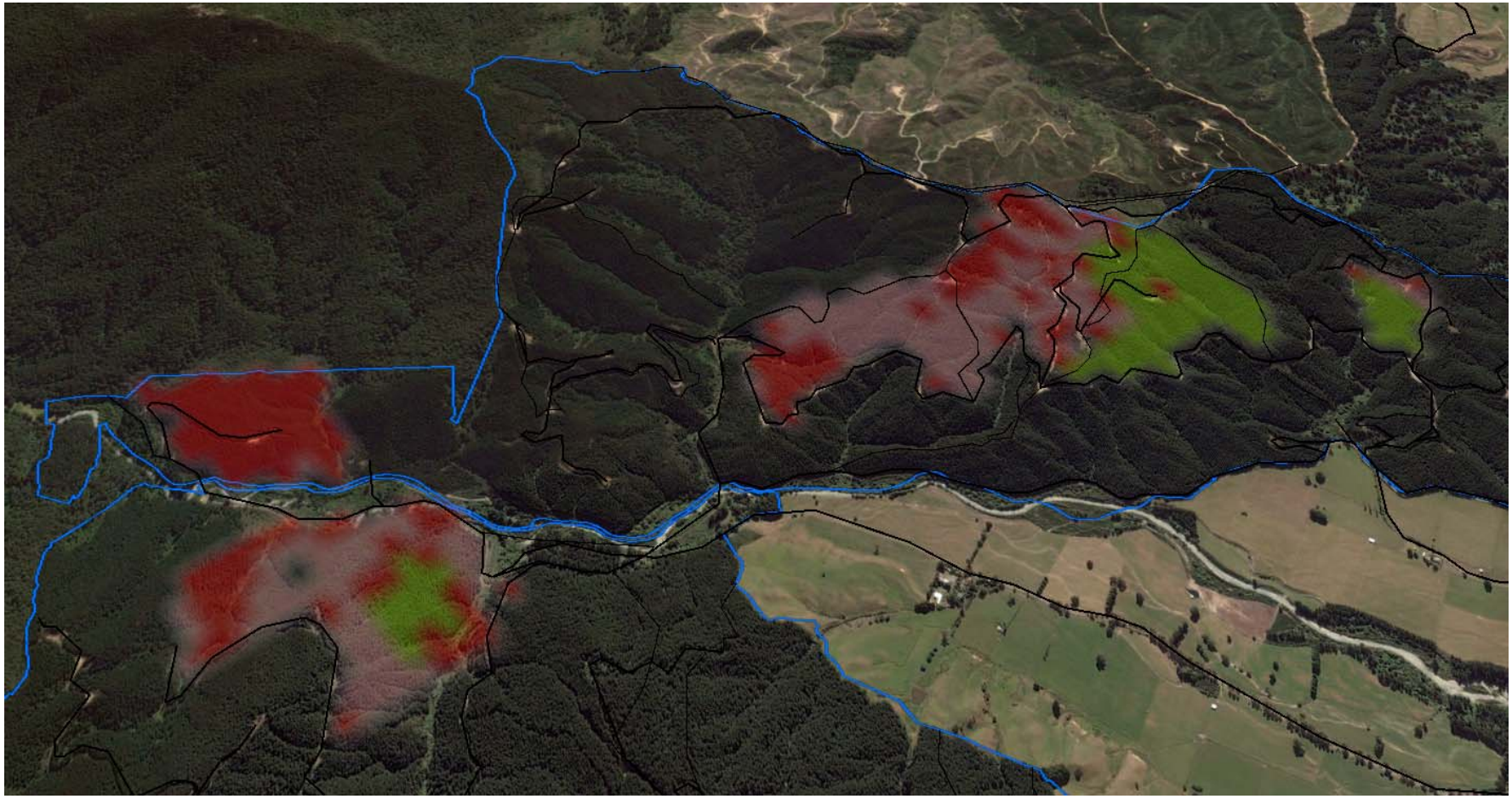
4.1 Crop Performance



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4.2 Forest Health Assessment

Forest Health – Can use satellite analysis (Near Infrared and ESRI Image Classification) to target ground inspections to areas of poor health/ performance

Nb: Example of analysis provided by Margules Groome

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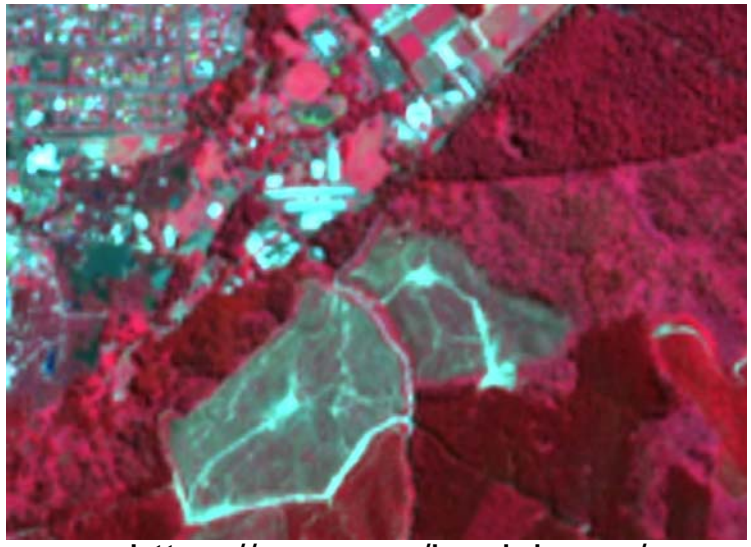
5. Summary

- Satellite imagery provides some useful applications
  - Fire Management
  - Mapping applications, especially following storm events, can coverage large areas quickly.
  - Monitoring crop performance without expense of LiDAR or plotting.
  - Potentially other uses, especially as resolution improves……
  - All examples are from imagery that is available for **free**.



https://eos.com/landviewer/

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6. Useful Data Websites

- www.Google.com
- https://eos.com/landviewer/ & https://sentinel-hub.com/
- https://scihub.copernicus.eu/
- https://earthdata.nasa.gov/earth-observation-data/near-real-time/firms/active-fire-data
- https://earthexplorer.usgs.gov/

https://eos.com/landviewer/

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