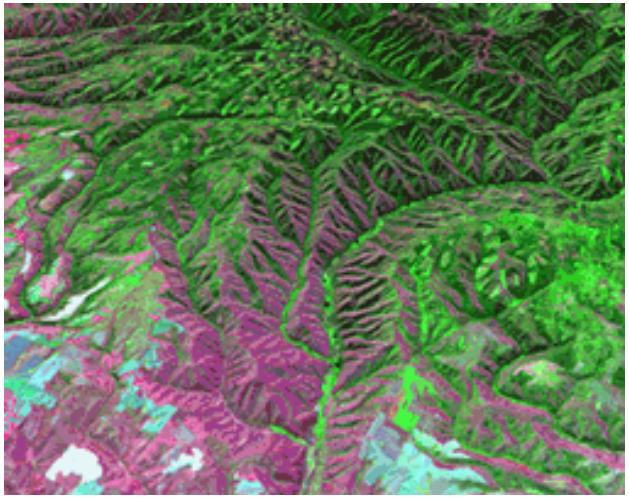
Burn Severity Mapping

Differenced Normalized Burn Ratio
Burn Area Reflectance Classification



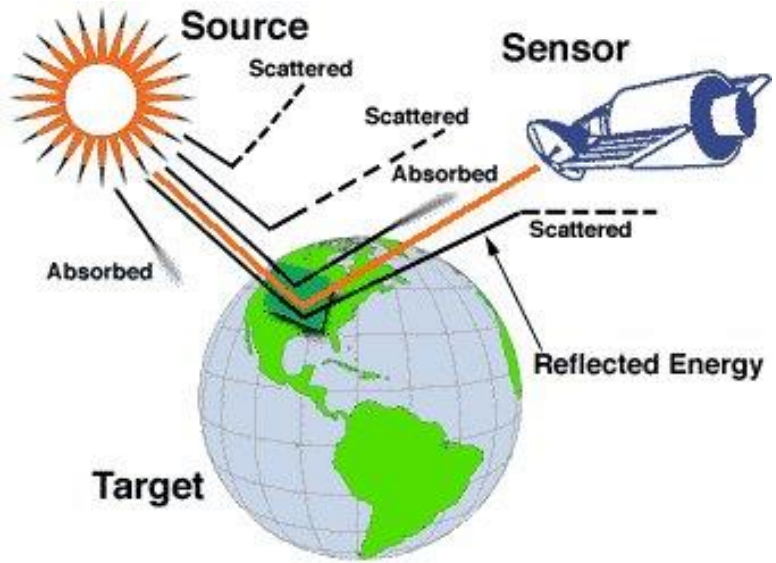
Will Burt
FLNRO Kootenay Boundary Region
Geomatics

Burn Severity Mapping Tool

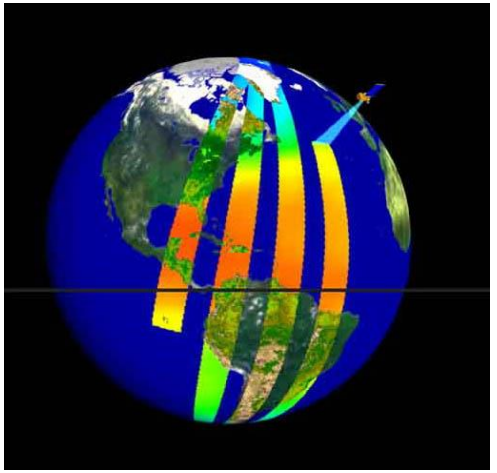
- Remote Sensing Background
- Selecting and downloading imagery
- How the classification works
- Field Calibration
- Applications

Remote Sensing Background

- Utilizes passive sensor (Landsat)
- Light from sun passes through atmosphere, reflects off earth, returns through atmosphere to sensor
- Atmospheric correction attempts to remove effects of scattered radiation to produce an image of reflection at the surface



- This burn severity classification tool uses Landsat imagery
- The Landsat program utilizes a polar orbit
- The rotation of the earth allows for complete earth coverage
- Both ~~Landsat 5~~,Landsat 7,Landsat 8 have a 16 day return period.
- Landsat 5 **1984 –2012 RIP**☹



Downloading images

- Requires two images (pre/post wildfire)
  - acquired at a relatively similar time of year
  - cloud and smoke free
  - Minimize time between pre and post wildfire mages
  - Best to have ‘green’ conditions is dependent on the amount of chlorophyll in vegetation
  - Landsat data is **free**

This is my kind of remote sensing ….

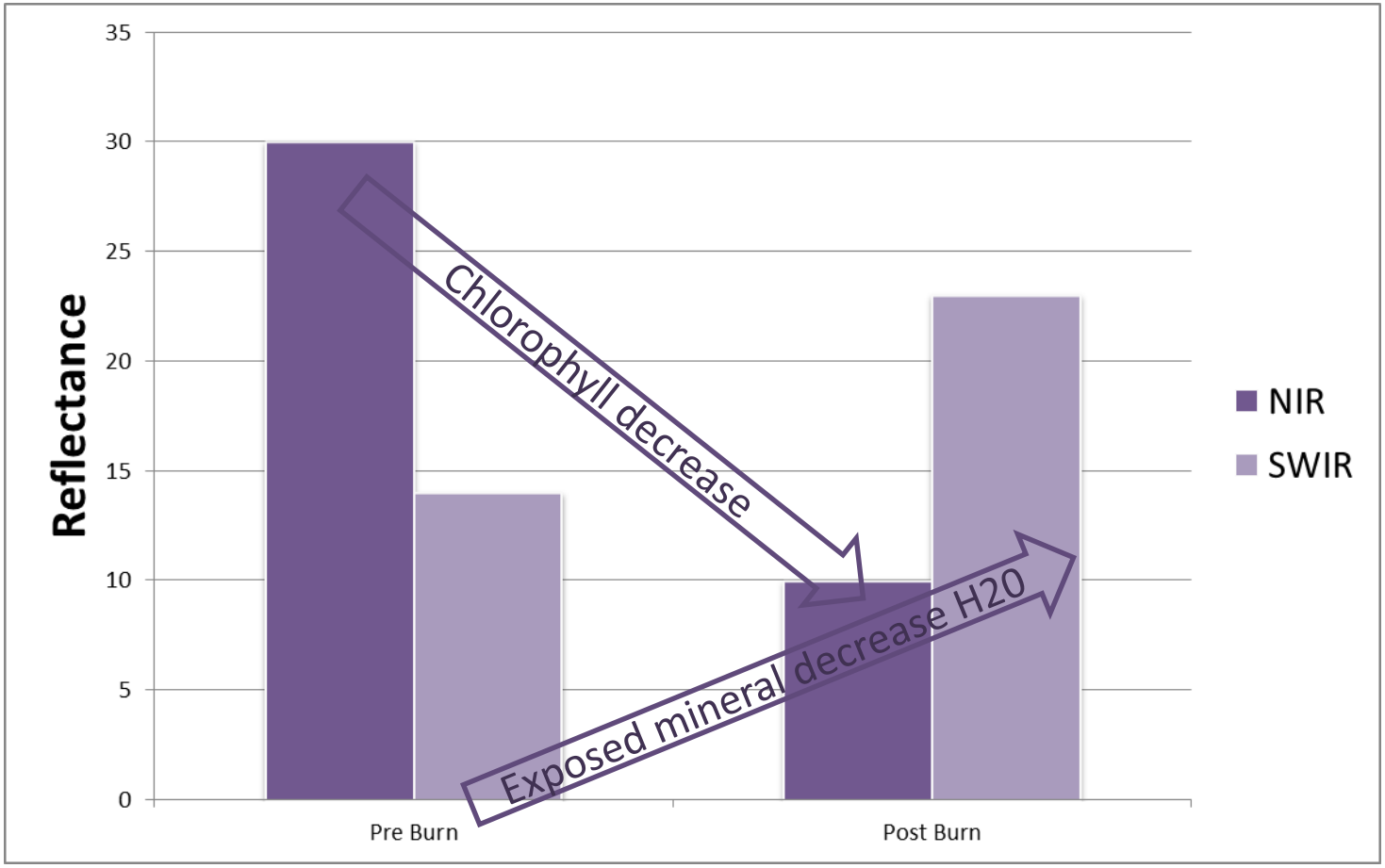
How it works

Generate an NBR image for each scene, pre- and post-fire:

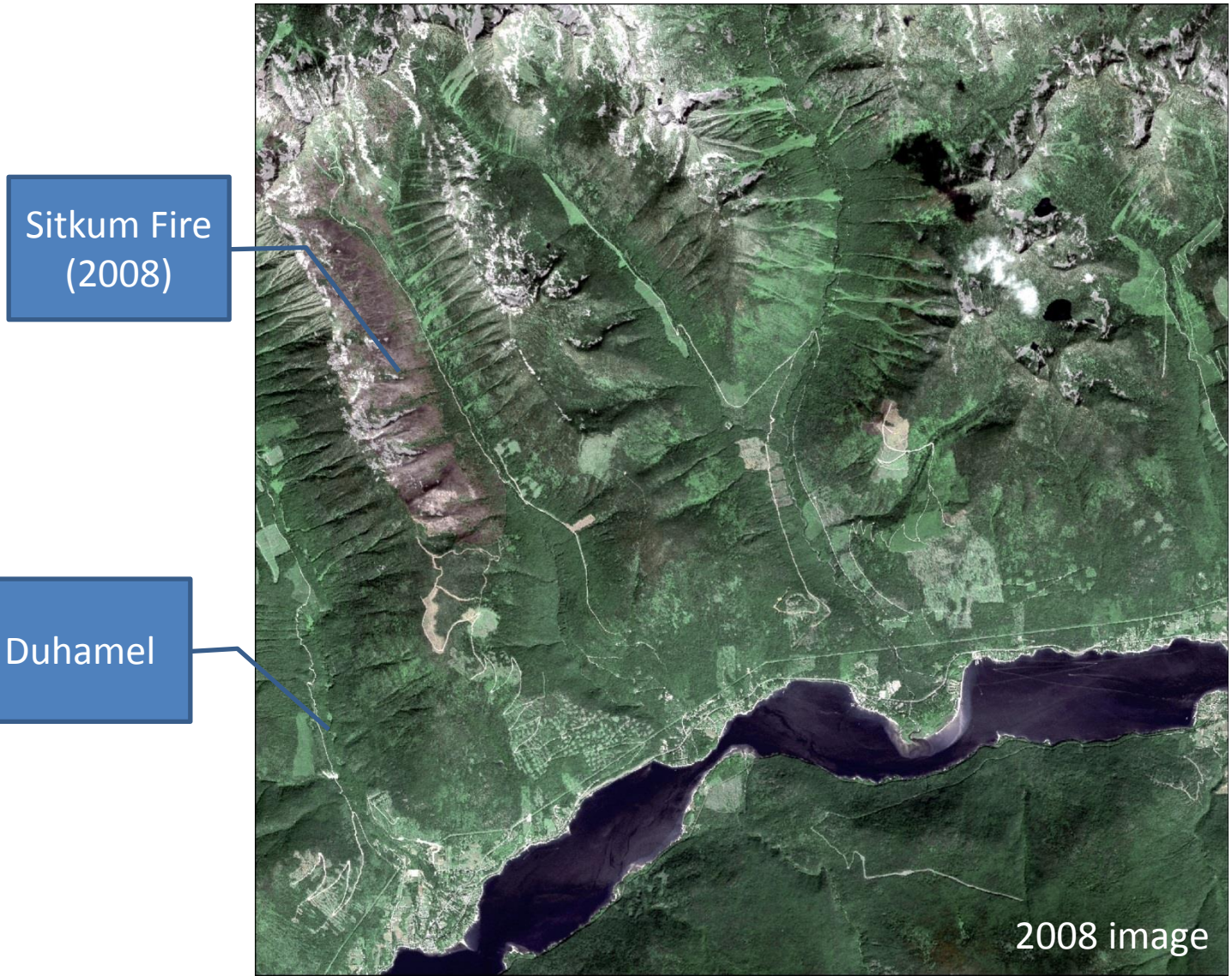
$$NBR = (R_4 - R_7) / (R_4 + R_7);$$

Generate the differenced (or delta) NBR:

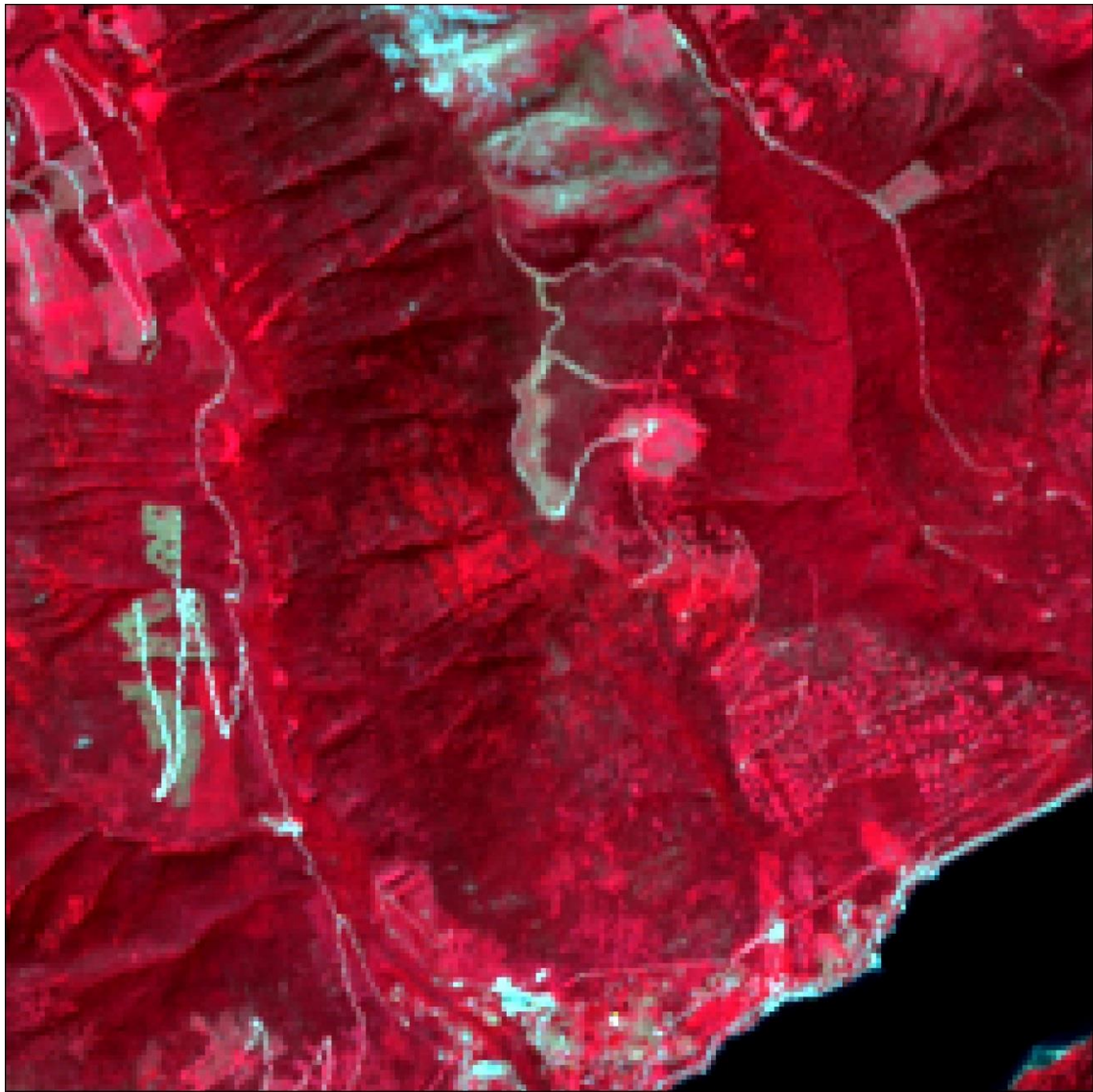
$$dNBR = NBR_{prefire} - NBR_{postfire}$$



For example – Duhamel fire 2015



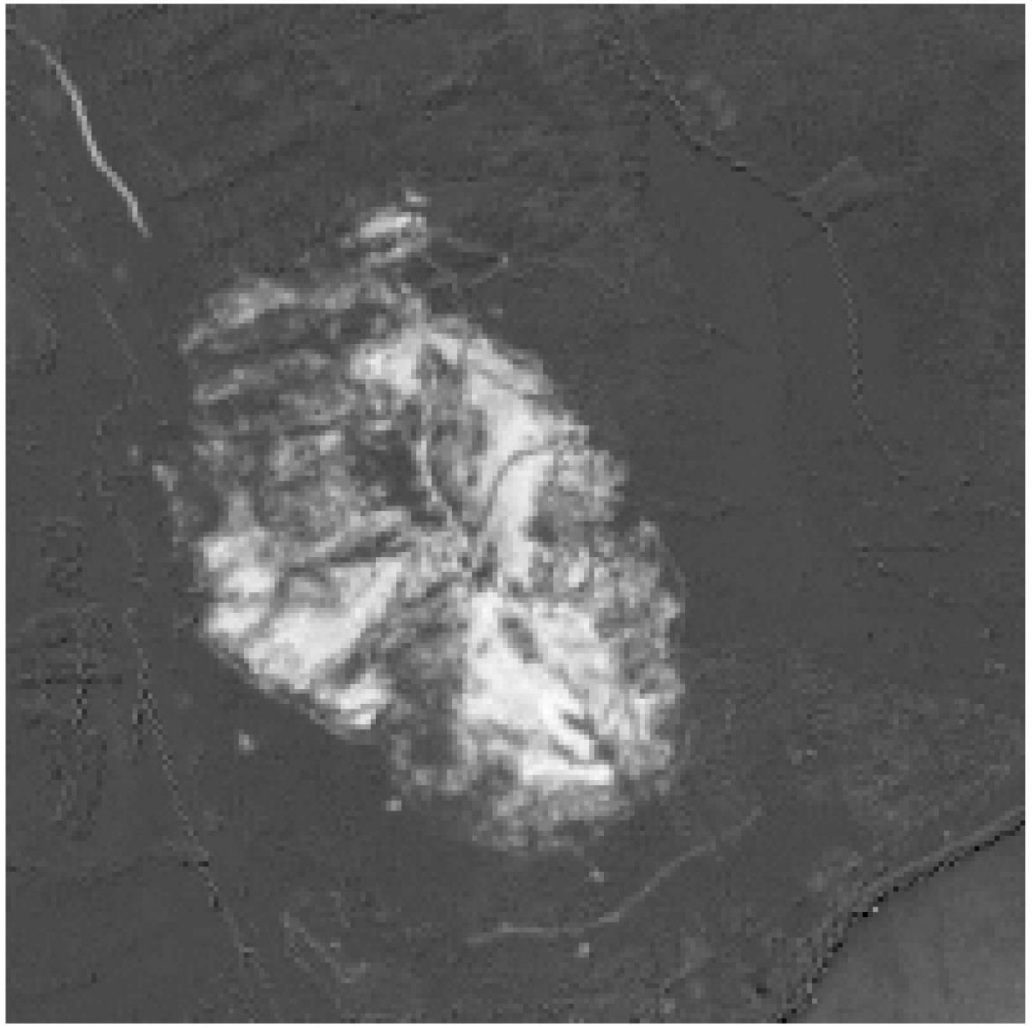
July 4, 2015



August 12, 2015

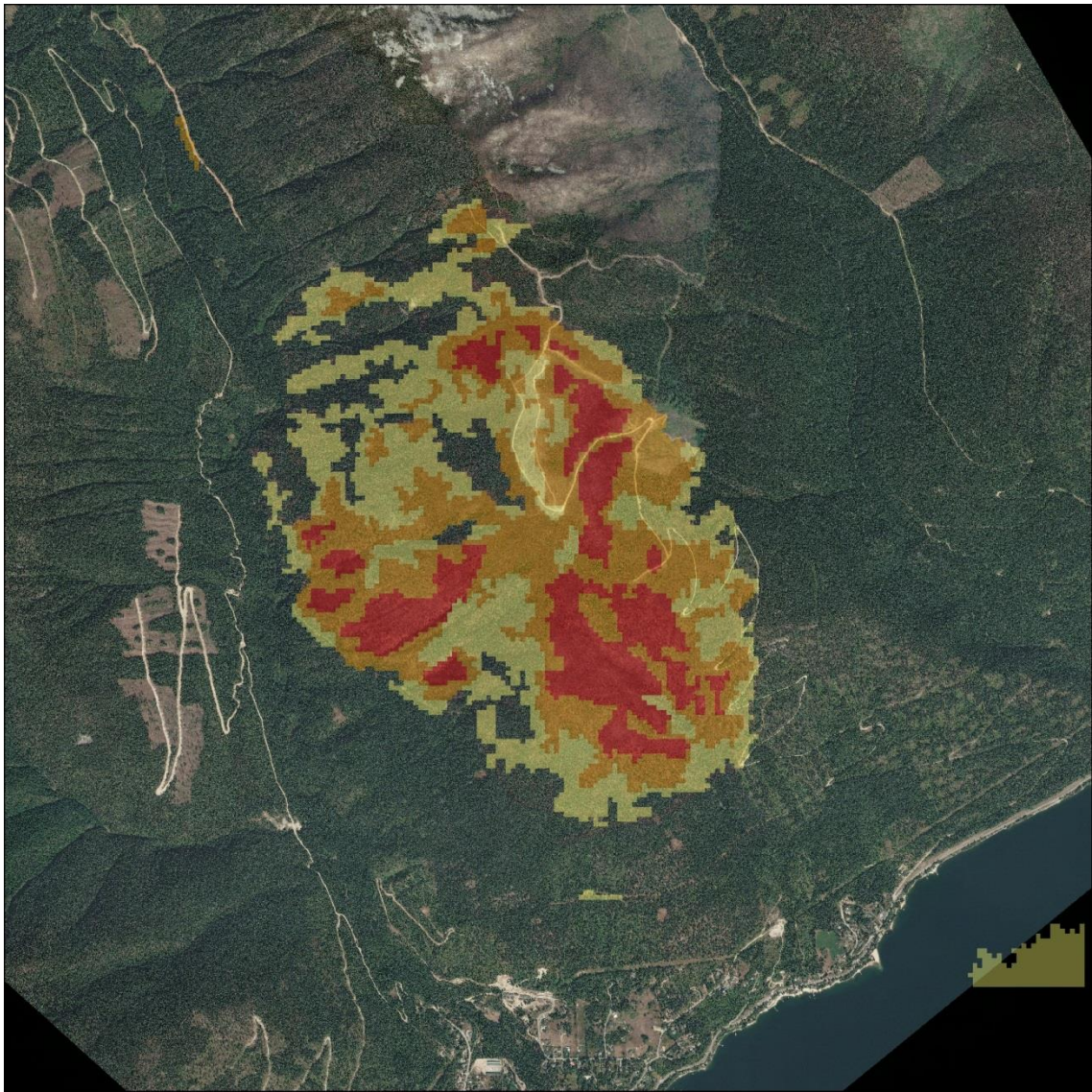
Differenced Normalized Burn Ratio

DNBR



Resulting Classification

- Severity Class(default)
  - High (>187)
  - Moderate (110-187)
  - Low (76-110)
  - None (<76)



Resulting Classification

Overview

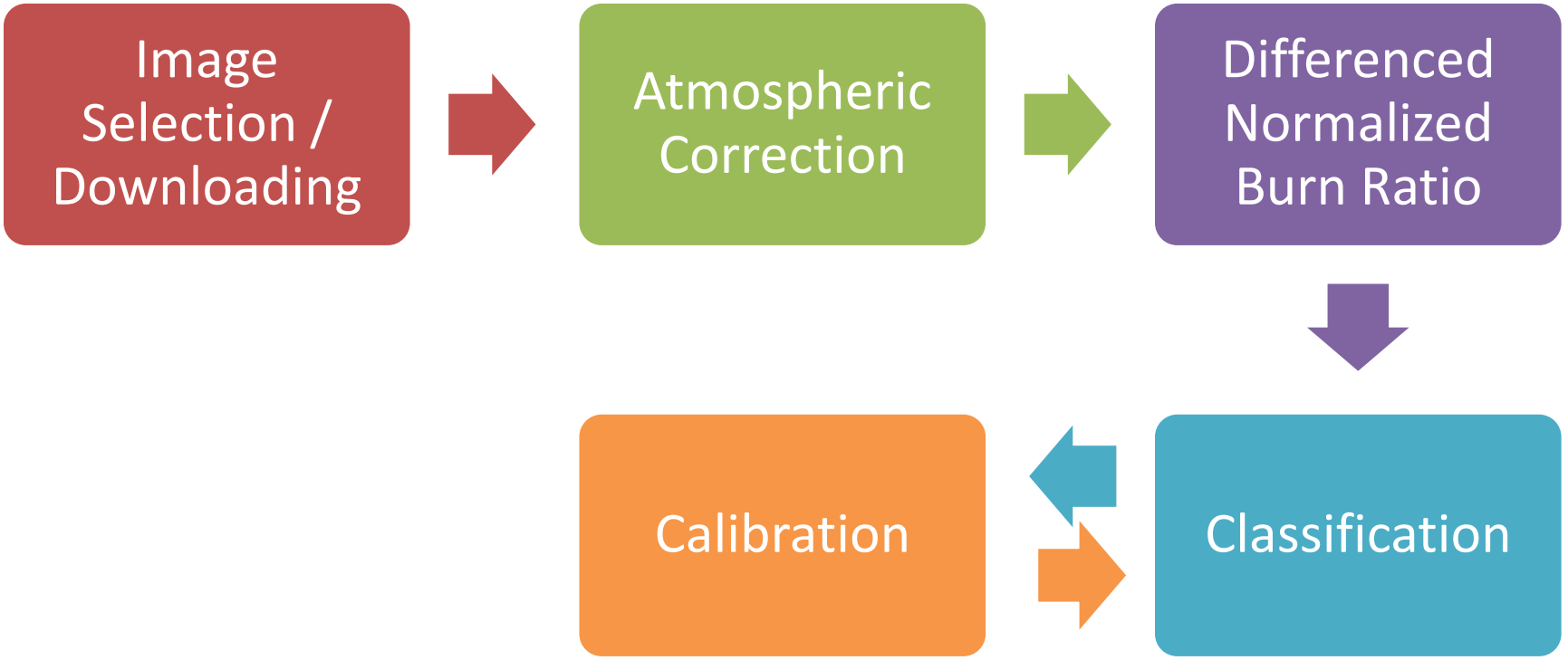


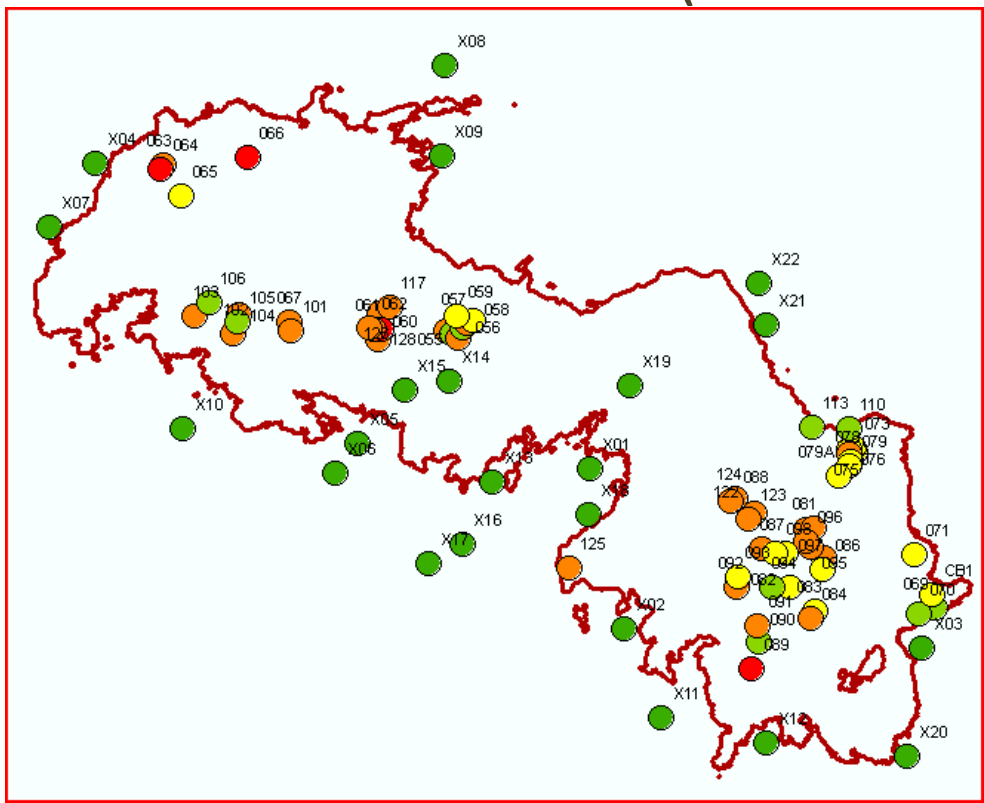
Image Selection / Downloading
Atmospheric Correction
Differenced Normalized Burn Ratio
Classification
Calibration

Field Calibration – essential component

- A measure of the effect on the environment
  - Trees
  - Underbrush
  - Grasses
  - Soil
- Not fire intensity

Use sample to refine classes

- Use plot of DNBR Value to observed field class as aid
- Tweak class ranges and rerun
- Fix any change events that are non-fire related (new harvest, beetle kill, etc



Applications

- **This tool was initially created for the Post Wildfire Risk Assessment Team (Public Safety, Infranstructure at Risk)**

Spin-off Uses Province Wide

- Timber loss assessment
- Timber Salvage
- Range
- Forest Health
- Inventory
- Wildlife Habitat

Current State

- BC Government version of this tool is maintained by Will Burt and Graham MacGregor
- Many staff across the province trained to create BARC (Burned Area Reflectance Classification)
- Provincially 15 fires 2015 as part of Post Wildfire Risk and Fire Operations (Rehab)
- Seeing increasing demand for other uses

Future State (next season)

- Automated classification for fires greater than *x* hectares
  - Automated image download
  - Cloud/smoke detection smarts
  - Resulting vector data to central storage (BCGW) and public distribution service
  - Resulting vector data to be used for VRI updates
- Collaboration with FAIB, Thompson/Ok, Caribou, Kootenay Boundary Regions

Thanks