GIST 8118

Remote Sensing and GIS

Outline

- Lecture
  - The Course
  - What is remote sensing
  - Software used
  - Course Details
- Lab
  - Module 1
    - Reading – Introduction to Remote Sensing
    - Tutorial Focus
    - Assignment

The course

- The course examines:
  - current satellite image acquisition systems;
  - image display and enhancement;
  - image geocoding
  - image classification; and
  - remote sensing applications in GIS.
- Digital image processing and analysis techniques are studied in **theory** and in **practice** using digital image processing software.

What is Remote Sensing

- Definition
  - Remote Sensing is the **science** and **art** of obtaining *useful information* about
    - an object, area or phenomenon
  - Through the **analysis of data** acquired by a device at a *distance from* the object, area or phenomenon under investigation

Science

- Procedures developed by scientists and users
  - Steps to turn data into useful information
    - Its all Math
    - Contrast stretch; histogram equalization; convolution filtering; PCA; classification;rectificaiton
    - Good news!!!!

      Geomatica will do the calculations for you

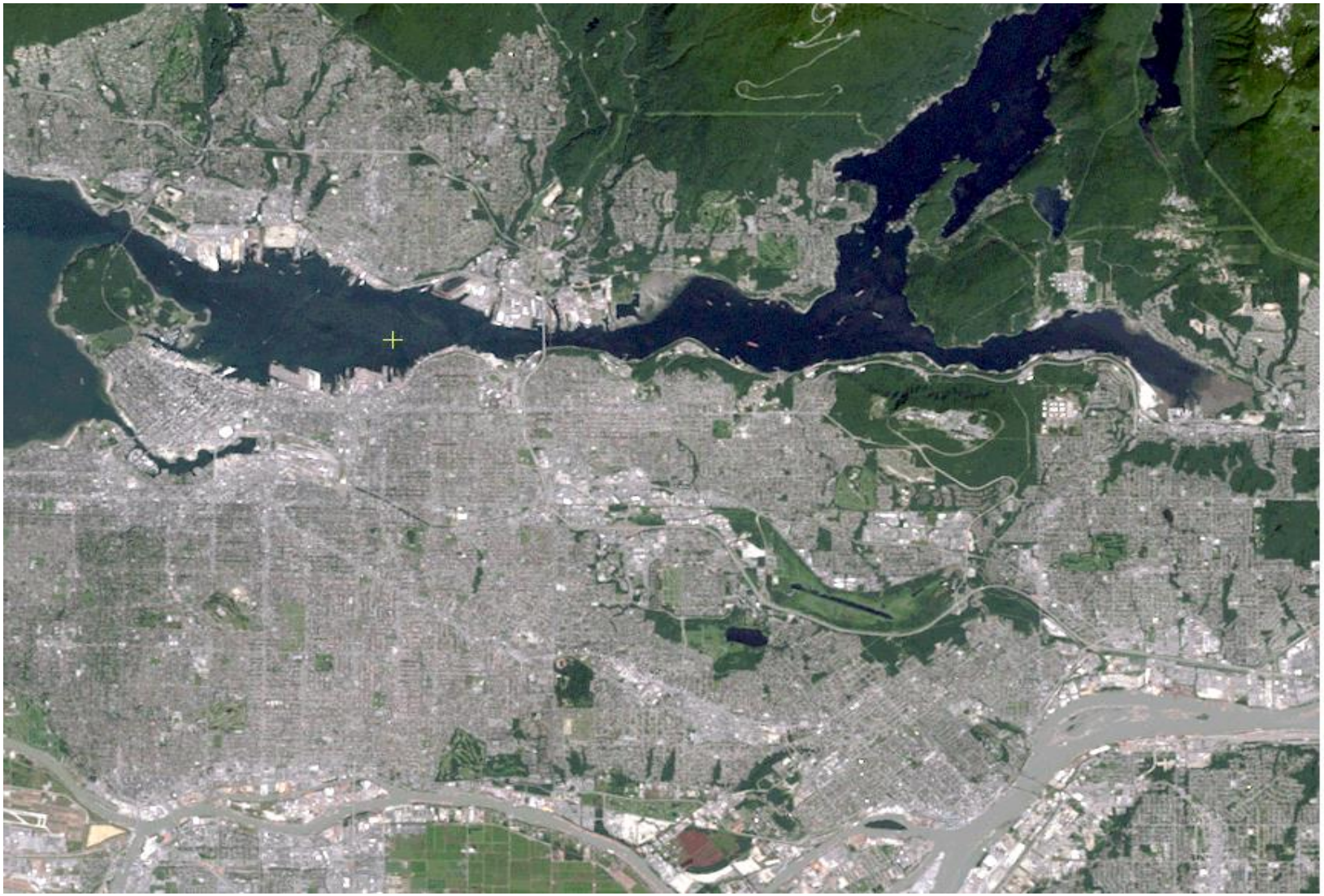
      You need to understand what is happening

      You will do very little math

Art

- Which procedure to apply
  - Many different ones for the same???? Result
- Depends on your purpose
  - Find weeds in crops
  - Find healthy crops
  - Determine crop growing
- Depends on your background
  - Have you traveled – seen different landscapes
    - City farm land mountain regions

Where?



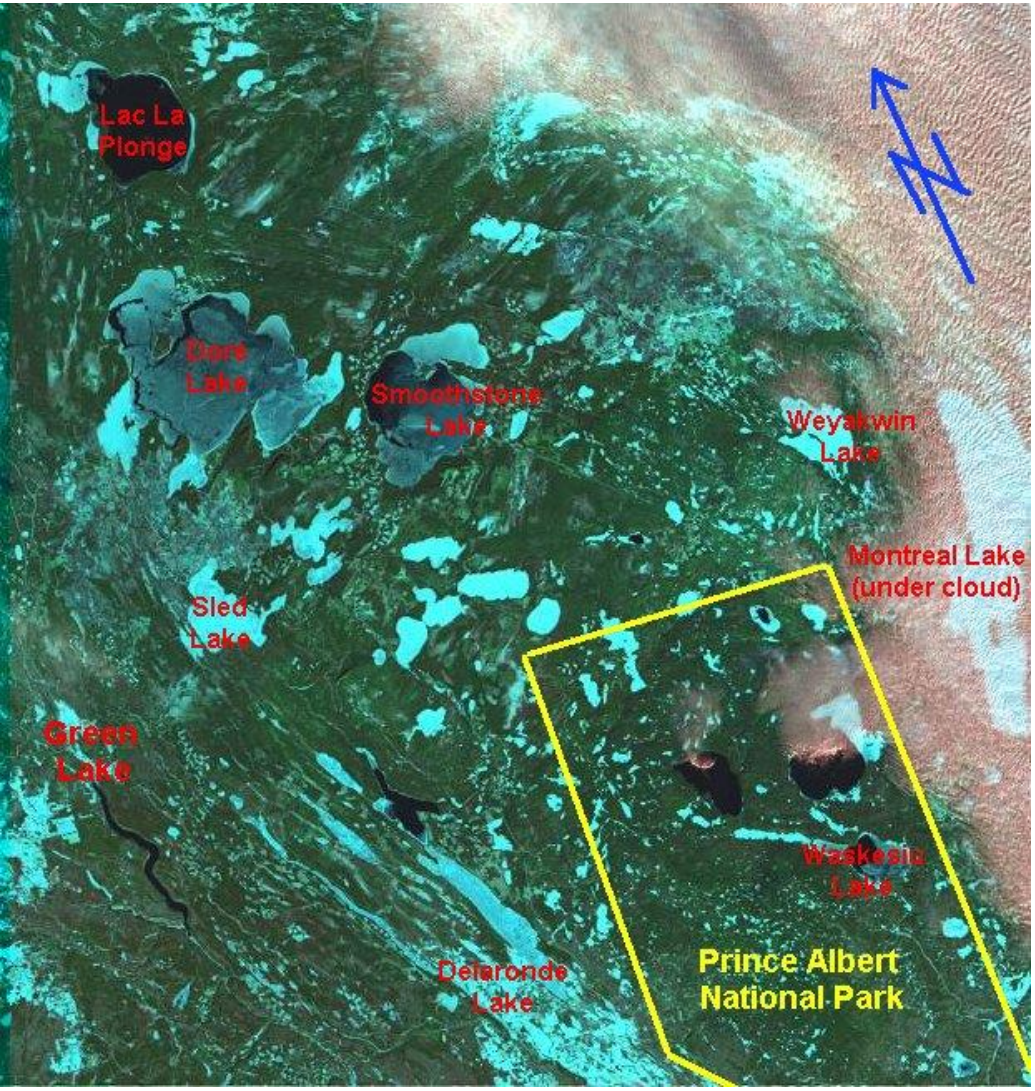
What?

http://www.spaceimaging.com/gallery/top10_2002/vancouver.htm

What/Where

What/Where

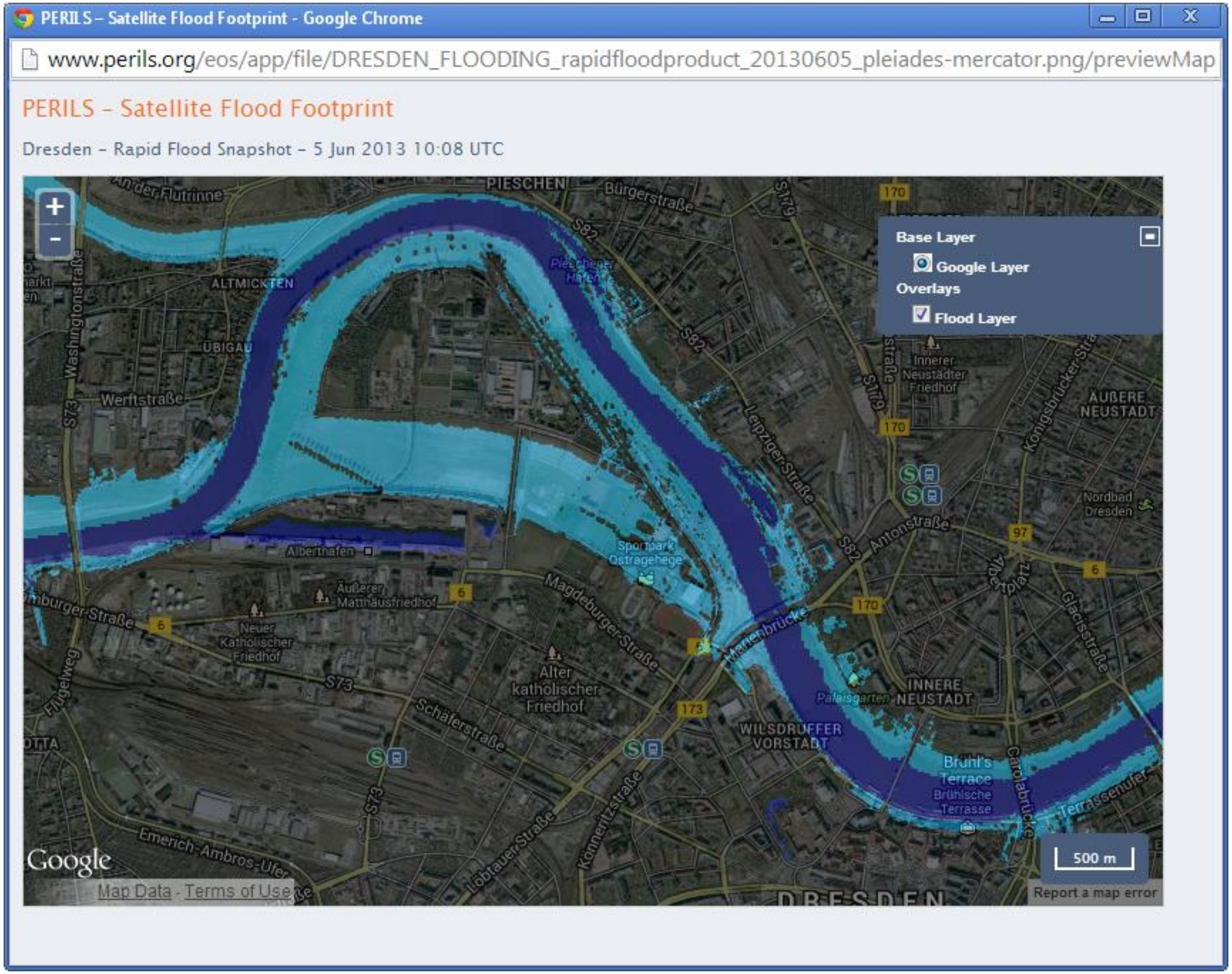
Forestry

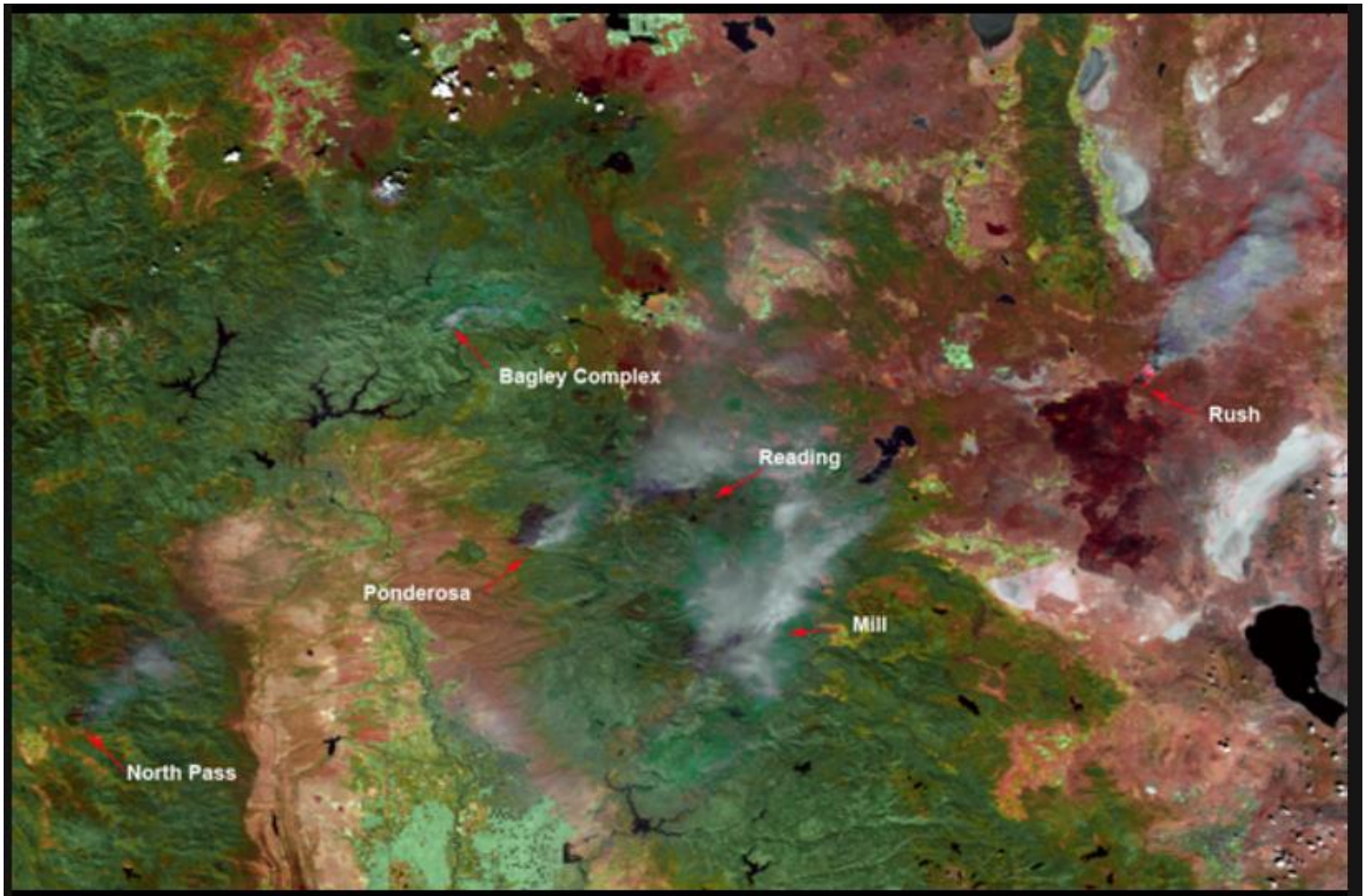

Lac La Ronge
Dore Lake
Smoothstone Lake
Weyakwin Lake
Montreal Lake (under cloud)
Sled Lake
Green Lake
Waskesiu Lake
Delaronde Lake
Prince Albert National Park

Natural Disaster

- Fires in CA
  - http://www.redding.com/photos/galleries/2012/aug/24/satellite-images-northern-california-fires/22449/#section_header
- Flooding in Europe
  - http://www.perils.org/web/products/earth-observation
- Hurricane Sandy before and after
  - http://www.theatlanticcities.com/neighborhoods/2012/11/-and-after-aerial-shots-new-jerseys-destroyed-neighborhoods/3796/

Flooding

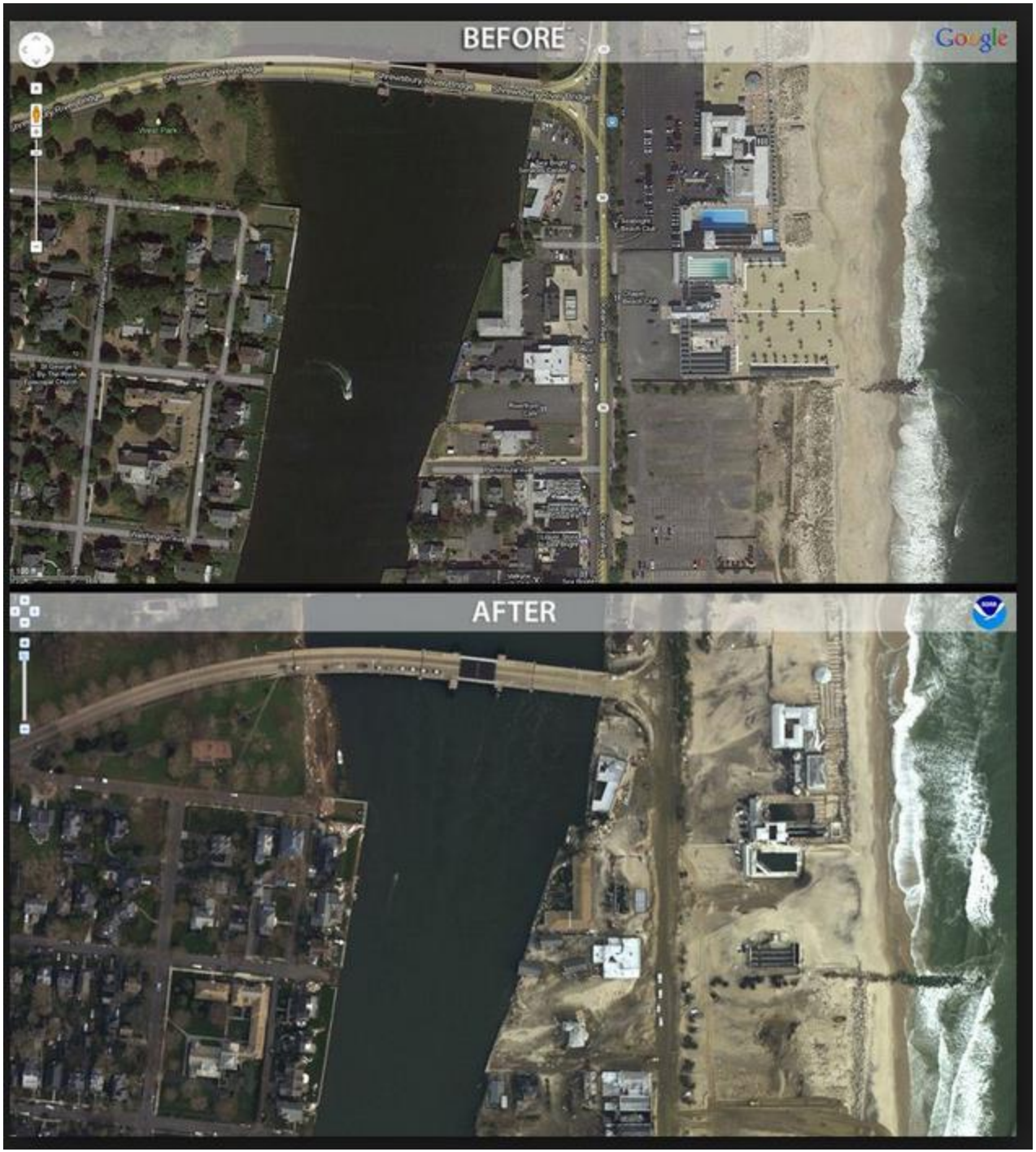

PERILS – Satellite Flood Footprint - Google Chrome
www.perils.org/eos/app/file/DRESDEN_FLOODING_rapidfloodproduct_20130605_pleiades-mercator.png/previewMap
PERILS – Satellite Flood Footprint
Dresden – Rapid Flood Snapshot – 5 Jun 2013 10:08 UTC
Base Layer
Google Layer
Overlays
Flood Layer
500 m
Report a map error
Map Data - Terms of Use



NOAA

Captured on August 20th, 2012, this image from the Suomi NPP satellites shows the smoke plumes from the fires afflicting Northern California. This close-up image uses a combination of high resolution visible and infrared imagery to distinguish not only the smoke plumes, but also the hotspots from the fires themselves (high pink color). The dark red-brown colors also indicate burn scars from where fires have been extinguished.

Hurricane Sandy

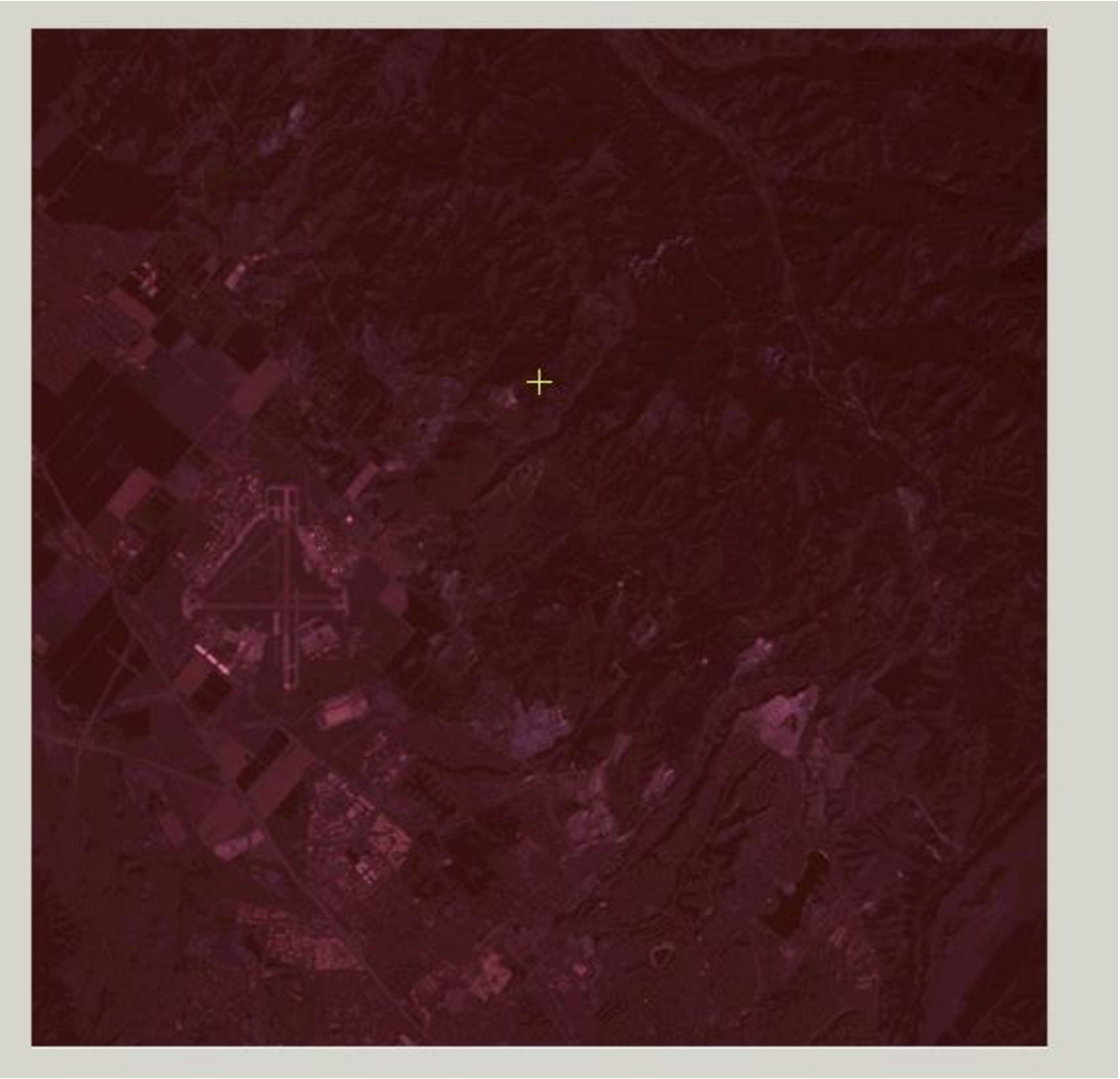


Web Primer

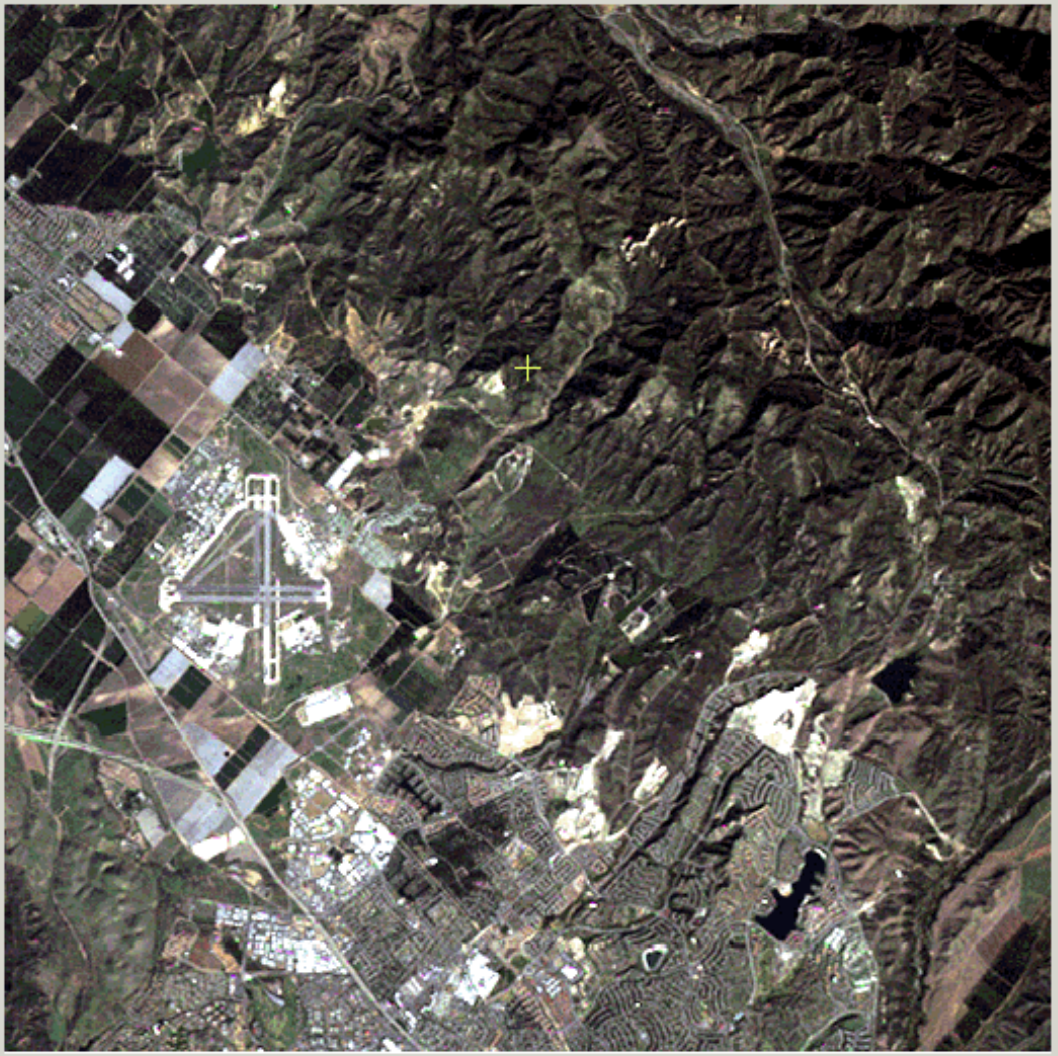
- Satellite Image Primer
  - WorldSat
    - Very brief introduction with examples
  - http://www.worldsat.ca/pages/10_satimg/intro.html
  - Very good visual guide to different products

Creating Useful Information

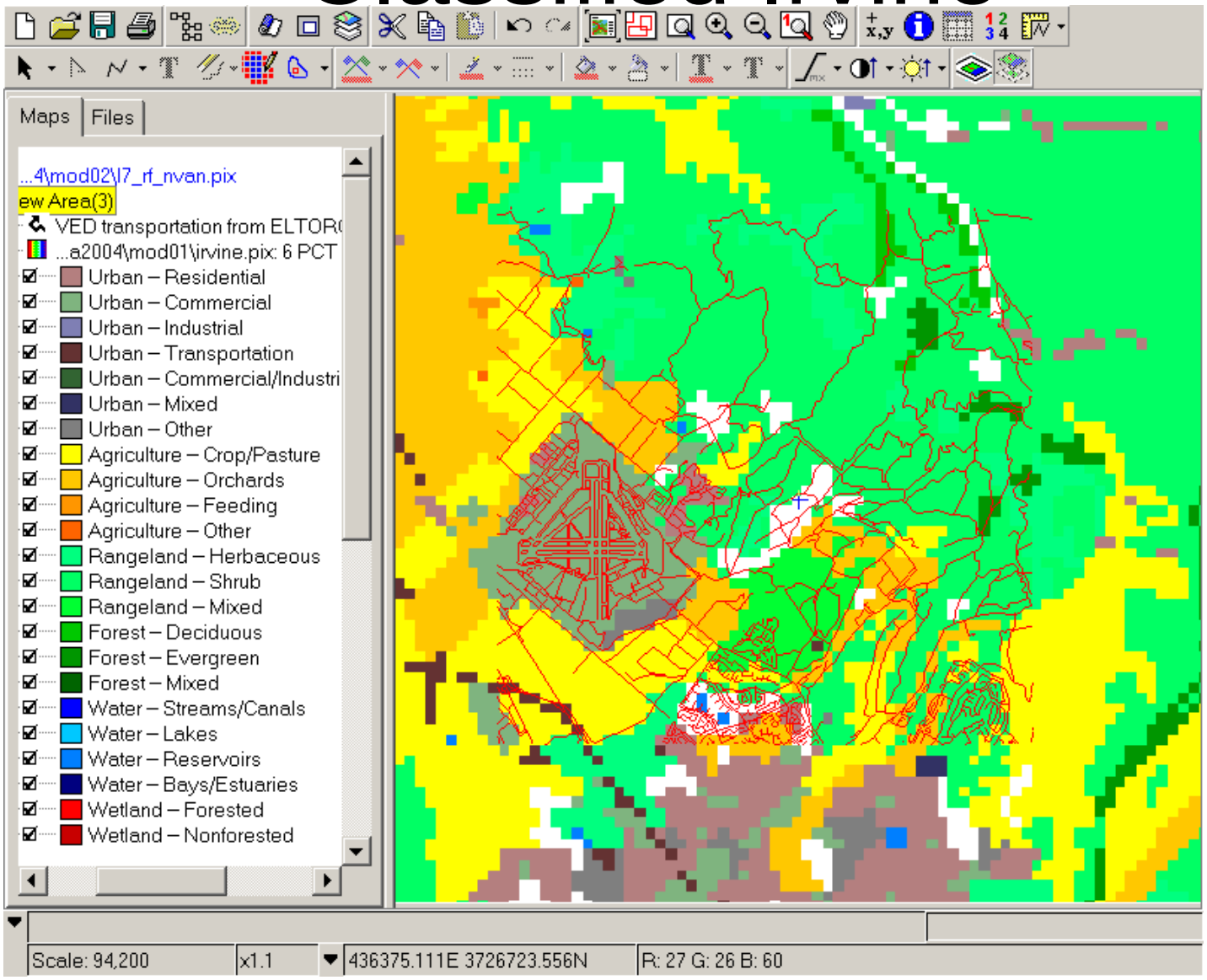
- Original
- irvine



Enhanced Irvine, CA



Classified Irvine



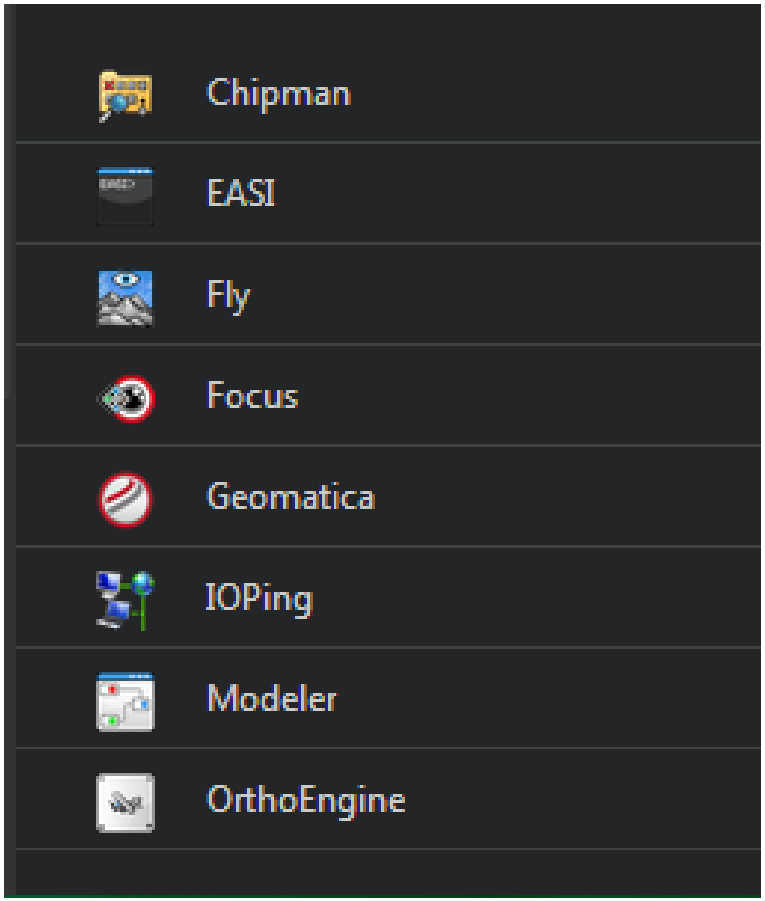
Software

- Geomatica 2015
- Created by PCI Geomatics
  - Richmond Hill
  - Ontario
- http://www.pcigeomatics.com/

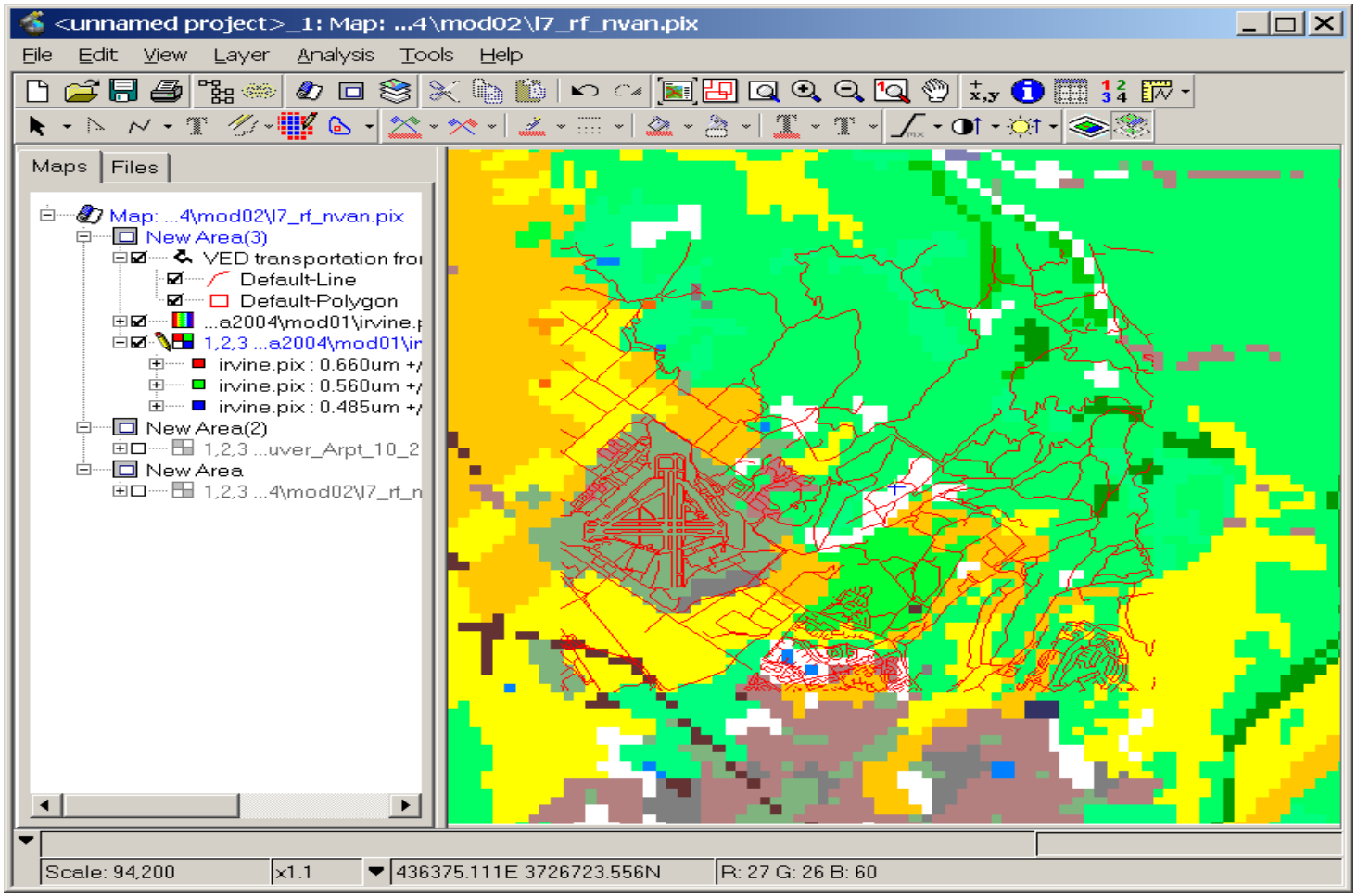
Software Applications

appsanywhere.bcit.ca

- Focus
  - Data display and analysis
- PCI Modeler
  - Models for analysis
- EASI
  - Command line/ programming
- ORTHOENGINE
  - orthophotos



Focus


<unnamed project>_1: Map: ...4\mod02\l7_rf_nvan.pix
File Edit View Layer Analysis Tools Help
Maps Files
Map: ...4\mod02\l7_rf_nvan.pix
New Area(3)
VED transportation fro
Default-Line
Default-Polygon
...a2004\mod01\irvine.
1,2,3 ...a2004\mod01\ir
irvine.pix : 0.660um +/
irvine.pix : 0.560um +/
irvine.pix : 0.485um +/
New Area(2)
1,2,3 ...uver_Arpt_10_2
New Area
1,2,3 ...4\mod02\l7_rf_n
Scale: 94,200
x1.1
436375.111E 3726723.556N
R: 27 G: 26 B: 60

Data

- Remote sensor collect
  - Eyes, airplane, hot air balloon, satellite
  - Focus on satellite collection
- Data exists we are not collecting
  - We will manipulate EXISTING to extract something useful
- Data stored in PCIDSK files
  - PIX extension

Images

- Raster data
- Displayed in focus

Numeric Values

Raw Data Enhanced Data

irvine.pix: [3] 0.660um +/- 0.030um TM band 3: red

	202	203	204	205	206	207	208
264	30	27	30	28	26	26	25
265	32	26	25	26	24	24	31
266	28	31	31	25	21	21	23
267	35	34	28	22	22	25	27
268	29	30	28	21	25	35	43
269	23	27	30	25	28	43	40
270	25	24	27	29	31	35	26

irvine.pix: [2] 0.560um +/- 0.040um TM band 2: green

	202	203	204	205	206	207	208
264	27	25	26	25	25	24	23
265	29	25	24	24	24	23	26
266	26	27	27	24	21	19	21
267	28	28	23	22	21	23	23
268	24	24	24	20	23	30	34
269	22	23	25	23	25	33	32
270	23	23	24	24	26	28	24

irvine.pix: [1]0.485um +/- 0.035um TM band 1: blue-gre

	202	203	204	205	206	207	208
264	65	63	64	64	62	58	60
265	67	65	61	61	63	61	63
266	66	65	66	62	59	57	58
267	71	69	61	61	59	61	63
268	63	66	65	58	63	69	75
269	59	65	66	63	63	75	70
270	61	61	65	63	64	69	62

Close Export Help

The Work

- Theory
  - Readings assigned each week
  - Outline overheads with notes
    - Cover main topics of the week
- Practice
    - Tutorials, and exercises
- Evaluation
  - Assignments 10 = 30% of your grade
  - Midterm = 30 %
  - Final Exam = 40 %

The Schedule

- See D2L
- Midterm
  - Short answer/multiple choice
  - Lecture/readings/lab work
  - Modules 1-5
  - About 20 question
- Final Exam
  - 30% like midterm
  - Modules 6-10
  - 10% problem solving (entire course)

Required Material

- Storage media
  - USB
- No text
  - On line reading
  - Canadian Centre for Remote Sensing
- D2L – desire 2 learn
  - Modules (practical exercises)
  - Assignments – and hand in
  - Lecture notes
  - Some readings
  - Learn.bcit.ca

Contact outside of class

- Email mike_hill@bcit.ca
  - Subject must start with GIST8118 module number
- Office SW3-2079
  - Office hours posted on door
  - Can make an appointment

End of Lecture

On to practical exercises.