

GEOG 357

LECTURE 10

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- Midterm Prep
- Env Change Demos

Upcoming
Assignments

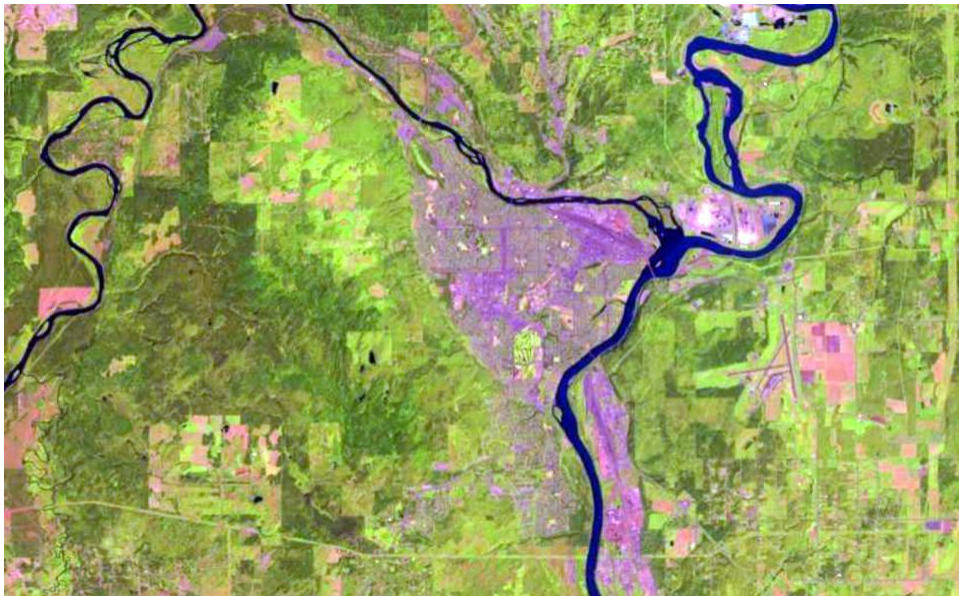
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Env. Change assignment 10% (Nov 4)

- The (free) Landsat image archive covers 1984 - 2020
- Select before/after images to show some selected change
 - This should be in an **area of interest** to you, both the location and topic / feature - e.g. deforestation, urban expansion, glacier retreat, fire, volcanic eruption etc..
 - Hence it could show a **gradual** or **catastrophic** change - it might be one event - just before and after
- Please send me
 - The before / after images
 - one page of descriptive text (word doc)
 - why you chose this pair
 - where is it - country/region
 - what has changed (and why)

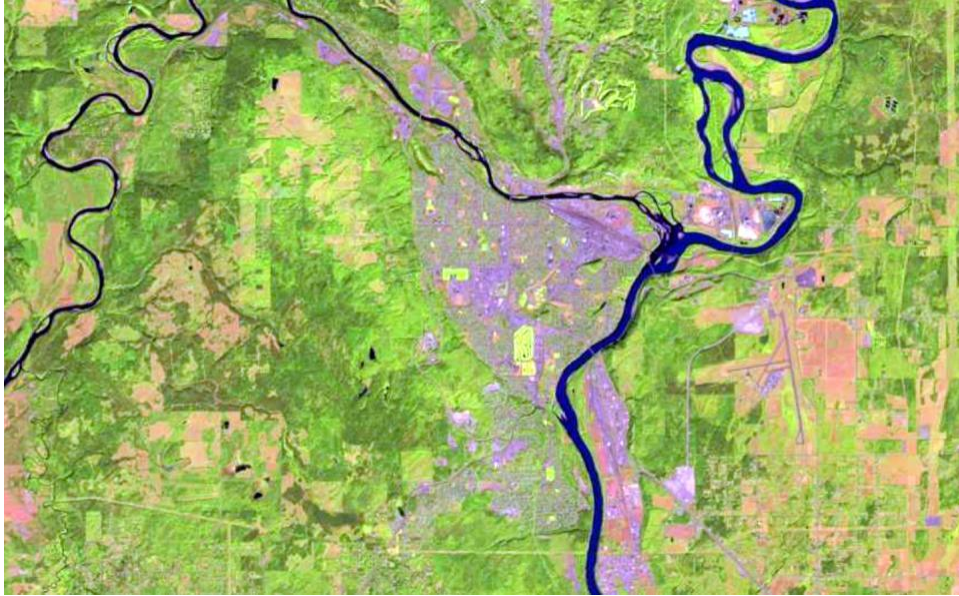
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Prince George, 25 July 1990



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Prince George, 17 August 2016

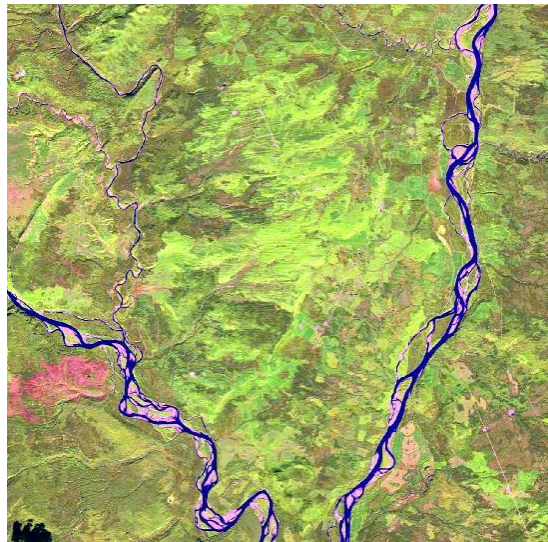


Match the scene date as far as possible – ‘anniversary date’ is ideal

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GEOG357 assignment example- before / after

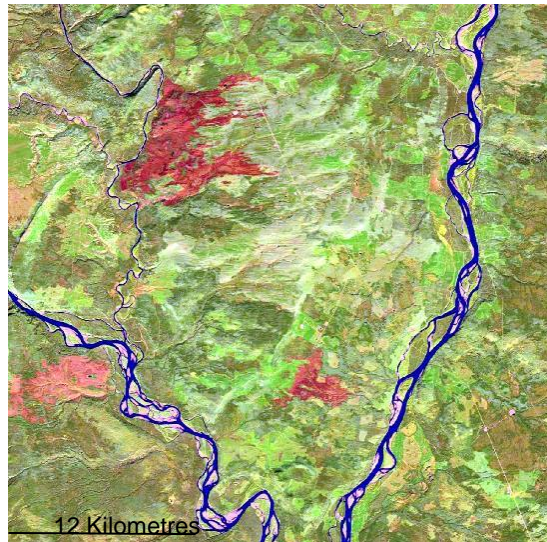
Nelson
Forks
September
3rd 2017



The first non-lab graded assignment – select/download two images showing change

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Nelson
Forks
September
9th, 2019

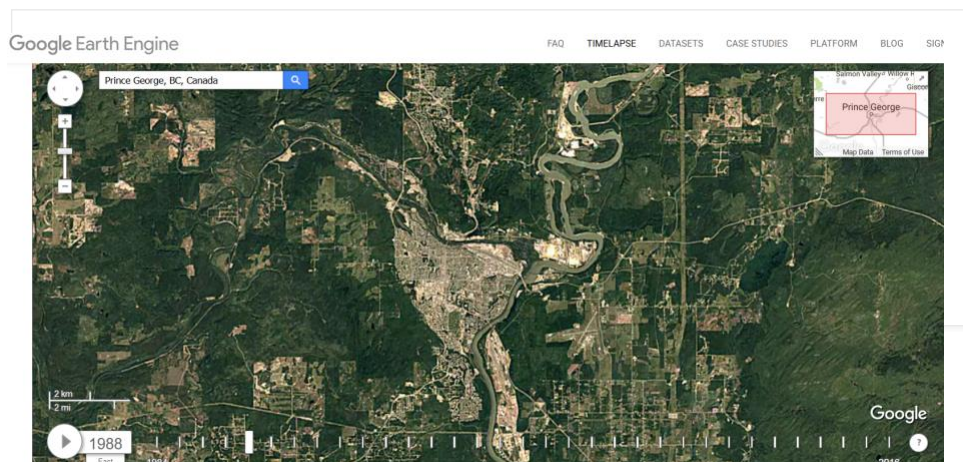


This was one of the student's last year, showing an area close to his home
Your sample area could cover an area and topic of interest to you and your studies

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Mapping and showing change Landsat images 1984 - 2019 (30m res.)

<https://earthengine.google.com/timelapse/>

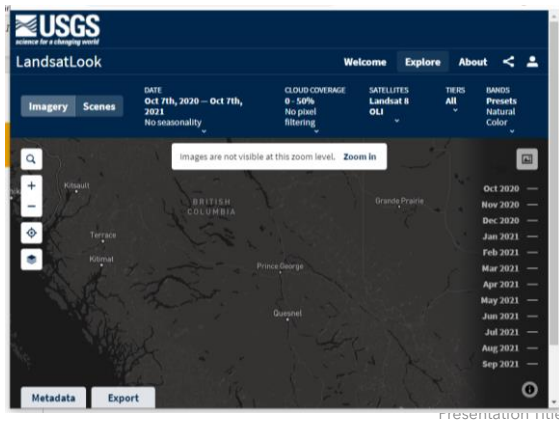


The google earth engine now shows 35 years of change around the world, though the images chosen are not always the best – they will be in your work !.. You can use the link above to review where they might be interesting changes (quite subtle in Prince George)

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LandsatLook Viewer

- <https://landsatlook.usgs.gov/explore>



You can start here to explore the images for your area of interest

You can download images from [EarthExplorer](#)

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Env. Change assignment 10%

- It may take you a long time to find the image. Start ASAP and pace yourself

- Thurs Nov 4th Lecture: 3 minutes each – demo your example

- Use a power point, 3 or 4 slides

- Thurs Nov 4th Send your writeup to m: jjumba@unbc.ca

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Midterm Prep

Mix of multiple choice and short answer questions
Content in Lectures including that of **Tues Oct 12th**

Multiple Choice

- Of these parts of the electromagnetic spectrum, which is the median in wavelength:
a. Mid-IR b. Red c. Thermal IR d. Green **e. Near IR**

Pre-exam Tip: put them in wavelength sequence and which is in the middle ?

- Which of these 3-band combinations form the **best** colour composite in terms of total information content and contrast ?
a. 1,2,3 b. 3,5,7 **c. 2,4,7** d. 2,3,4 e. 1,2,7

Pre-exam tip: most information/contrast is one band each from visible, near-IR and mid-IR

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Midterm Prep

Mix of multiple choice and short answer questions

Short Answer Questions

- Explain the difference between a Colour composite versus a pseudo-colour display

*Colour composite displays 3 bands (channels) in RGB colour guns;
Pseudocolour displays (only) one channel in a colour palette sequence (e.g. for classifications)*

- What is linear stretch (enhancement)

Linearly expanding the range of digital numbers with a limited range of values, to fill the full 8-bit display options for a band/channel/composite

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Midterm Preps

Review Landsat bands

The bands vary between sensors Landsat 4/5 TM, 7 ETM+ and 8 (OLI)

But have many similarities for continuity

Landsat-7 ETM+ Bands (µm)			Landsat-8 OLI and TIRS Bands (µm)		
			30 m Coastal/Aerosol	0.435 - 0.451	Band 1
Band 1	30 m Blue	0.441 - 0.514	30 m Blue	0.452 - 0.512	Band 2
Band 2	30 m Green	0.519 - 0.601	30 m Green	0.533 - 0.590	Band 3
Band 3	30 m Red	0.631 - 0.692	30 m Red	0.636 - 0.673	Band 4
Band 4	30 m NIR	0.772 - 0.898	30 m NIR	0.851 - 0.879	Band 5
Band 5	30 m SWIR-1	1.547 - 1.749	30 m SWIR-1	1.566 - 1.651	Band 6
Band 6	60 m TIR	10.31 - 12.36	100 m TIR-1	10.60 - 11.19	Band 10
			100 m TIR-2	11.50 - 12.51	Band 11
Band 7	30 m SWIR-2	2.064 - 2.345	30 m SWIR-2	2.107 - 2.294	Band 7
Band 8	15 m Pan	0.515 - 0.896	15 m Pan	0.503 - 0.676	Band 8
			30 m Cirrus	1.363 - 1.384	Band 9

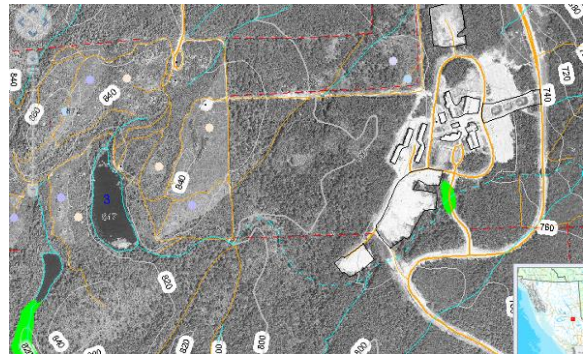
Landsat 7 has the Pan band added vs Landsat 5; Landsat 8 has Pan, plus Coastal / Cirrus bands

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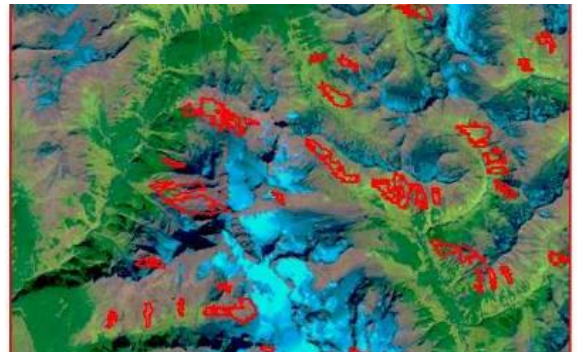
Image interpretation

- The analogue data unit is the photograph from a camera;
- the digital unit is the scene, composed of pixels, created by using a scanner.
- Analogue remote sensing involves interpretation, location & feature updating;
- digital applications include classification & feature extraction – based on DN's

Manual interpretation / digitization from photos



digital extraction of caribou habitats by Digital Numbers



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Elements of Image Interpretation

- Tone
- Texture
- Shadow
- Pattern
- Association
- Shape
- Size
- Site

9/4/20XX

Presentation Title

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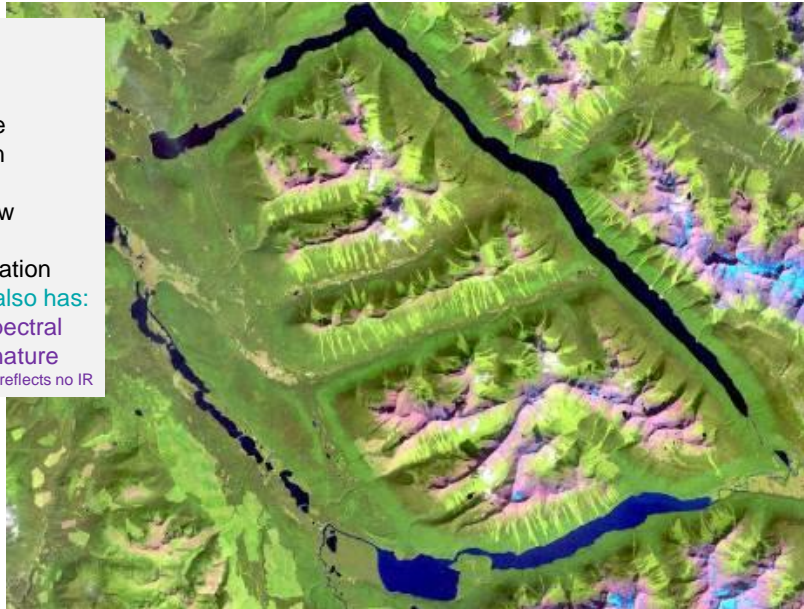
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Satellite Image interpretation – manually uses the same factors as Air photos

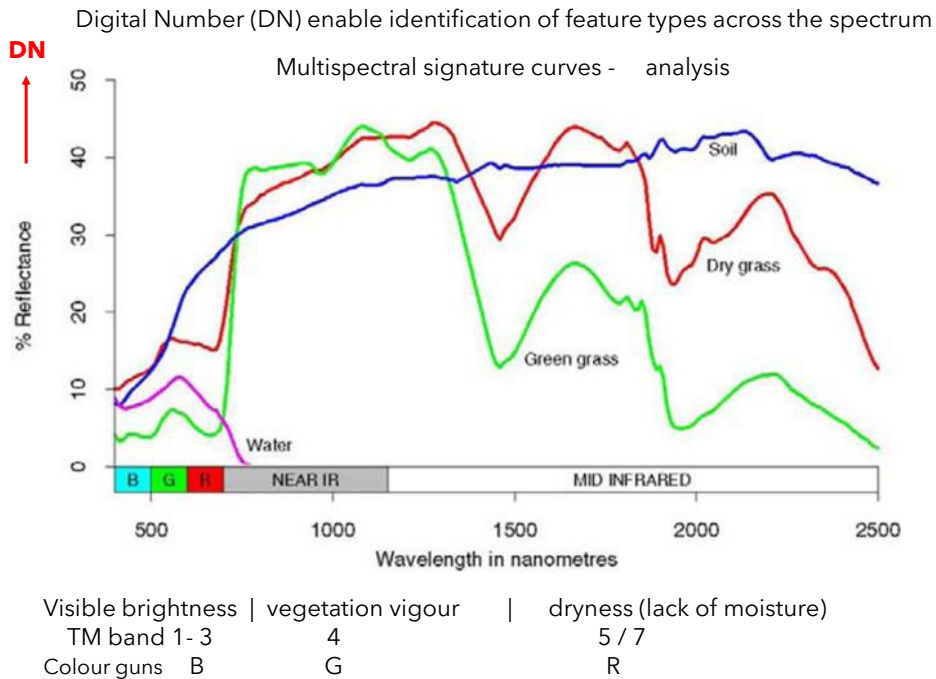
-Colour
-Tone

-Texture
-Pattern
-Shape
-Shadow
-Size
-Association

Digital also has:
-Multispectral
signature
-e.g. water reflects no IR



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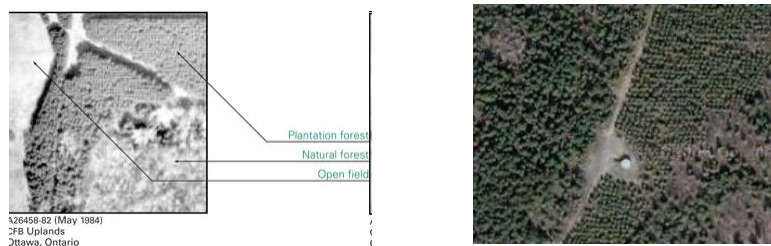
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Some examples of interpretation of photos and satellite images

Shape: the form of an object on an air photo helps to identify the object.
Regular uniform shapes often indicate a human involvement;



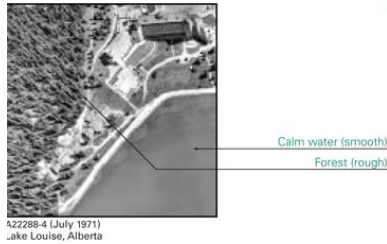
Pattern: similar to shape, the spatial arrangement of objects (e.g. row crops vs. pasture) is also useful to identify an object and its usage;



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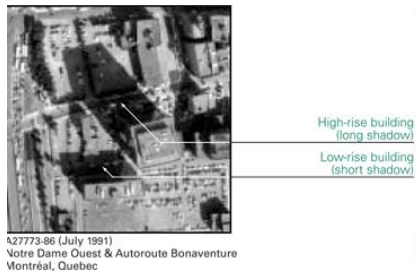
Texture: the physical characteristics of an object affects how they appear

e.g. calm water has a smooth texture;
a forest canopy has a rough texture



Catalyst: 'TEX'

Shadow: a shadow provides information about height, shape, and orientation



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Shadows: usually from the SE (~10am)



Northern hemisphere example - Mt. Robson

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Image interpretation



Did Aliens create Indian Head with an iPod ?

Badlands Guardian (CBC)



This feature can be found 300 KMs SE of Calgary. $50^{\circ} 1' N$ $110^{\circ} 7' W$

Identified from Google Maps/Earth by morning light / sun angle

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Deriba Caldera, Sudan ($13^{\circ}S$): from the Space Station - sun in NE in southern hemisphere

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Great Barrier Reef, Australia (20°S)



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Tasmania - sunlight from NE and note cloud shadows SW of clouds (would be NW in northern hemisphere)



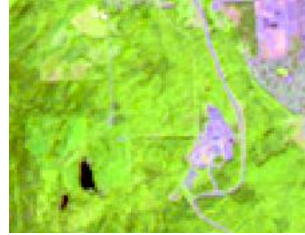
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Size: a measure of the object's surface area (e.g. single-lane vs. multi-lane highways);



A28411-345 (May 1999)
Highway 401 & Dufferin
Toronto, Ontario

Residential street
Multi-lane highway



A26233-78 (May 1983)
Ottawa, Ontario



A26479-112 (June 1984)
Ottawa, Ontario



A28267-31 (May 1996)
Ottawa, Ontario

Time: temporal characteristics of a series of photographs can be helpful in determining the historical change of an area (e.g. looking at a series of photos of a city taken in different years can help determine the growth of suburban neighbourhoods);

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Association/Site: associating the presence of one object with another, or relating it to its environment, can help identify the object (e.g. industrial buildings often have access to railway sidings);

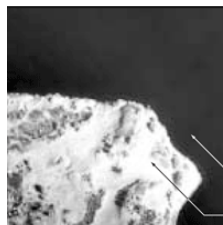


A27949-186 (July 1993)
Esquimalt Harbour, British Columbia

Dry-dock for ships
Railway access
Water



Tone/Colour: the colour characteristics of an object, relative to other objects in the photo (e.g. sand has a bright tone, while water usually has a dark tone; tree species can be determined by colour of leaves at certain times of the year);



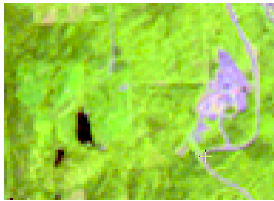
A26999-20 (August 1986)
Sandbanks Provincial Park
Picton, Ontario

Water
Sand



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Differences with some satellite images (compared to aerial photographs)



Spatial resolution
Shape and
pattern

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Landsat 5



Air photo



Pine Centre Mall and PG golf club

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