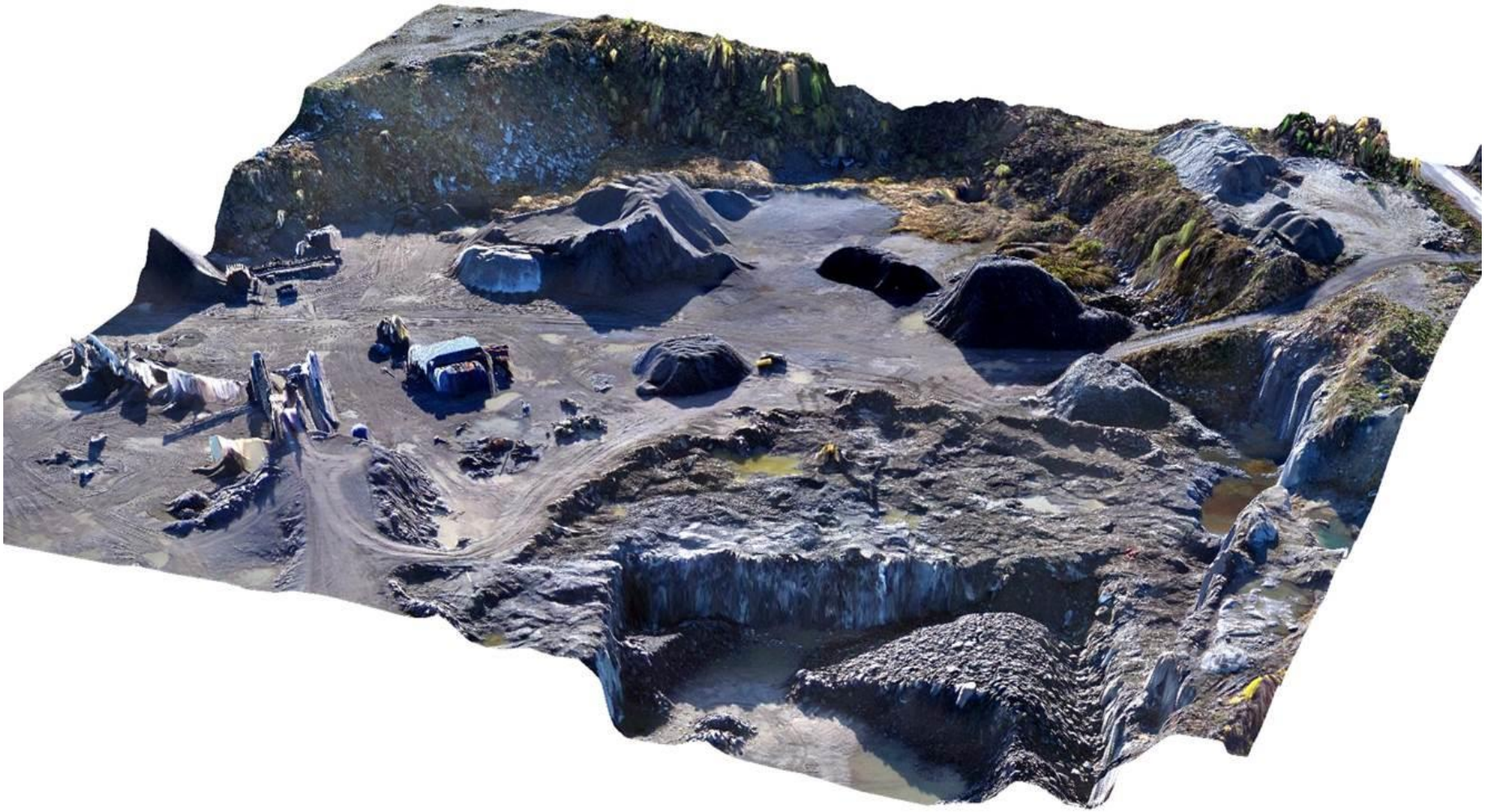
Paper : Remote Sensing & GIS / PG /2nd Sem.
Presented by : Dr. Tapas Pal

Aerial Photo Interpretation

Time period : 1 hour

- **Photogrammetry** is the art and science of making accurate measurements by means of aerial photography: Analog photogrammetry (hard-copy photos) Digital photogrammetry (digital images)



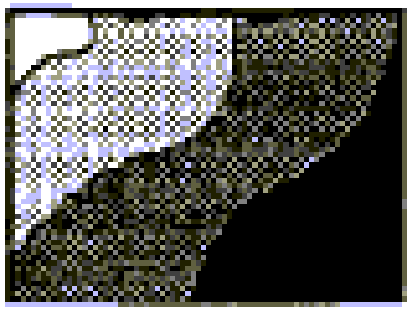
Aerial photograph & Aerial photography

- Aerial photograph refers to the photograph taken from aircraft.
- Aerial photography is defined as science and art of taking photographs from the air using aerial camera.
- Aerial photography is the taking of photographs of ground from an elevated position.

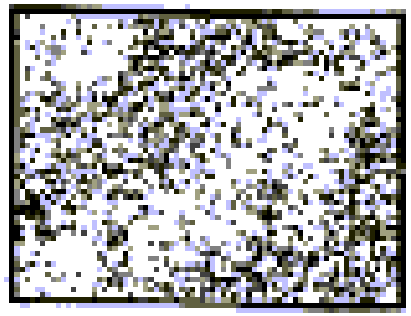
Air Photo Interpretation

OBJECT SIGNATURE CHARACTERISTICS

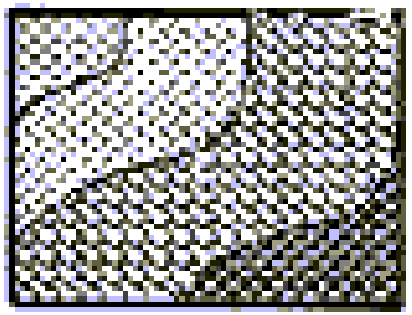
Tone



Texture

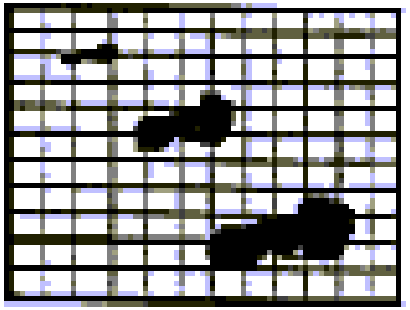


Pattern

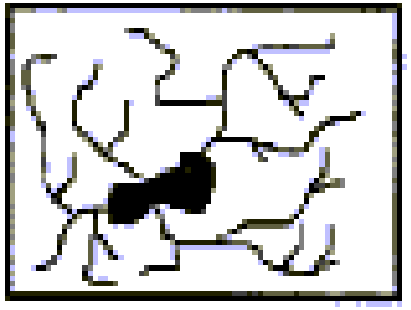


Shape

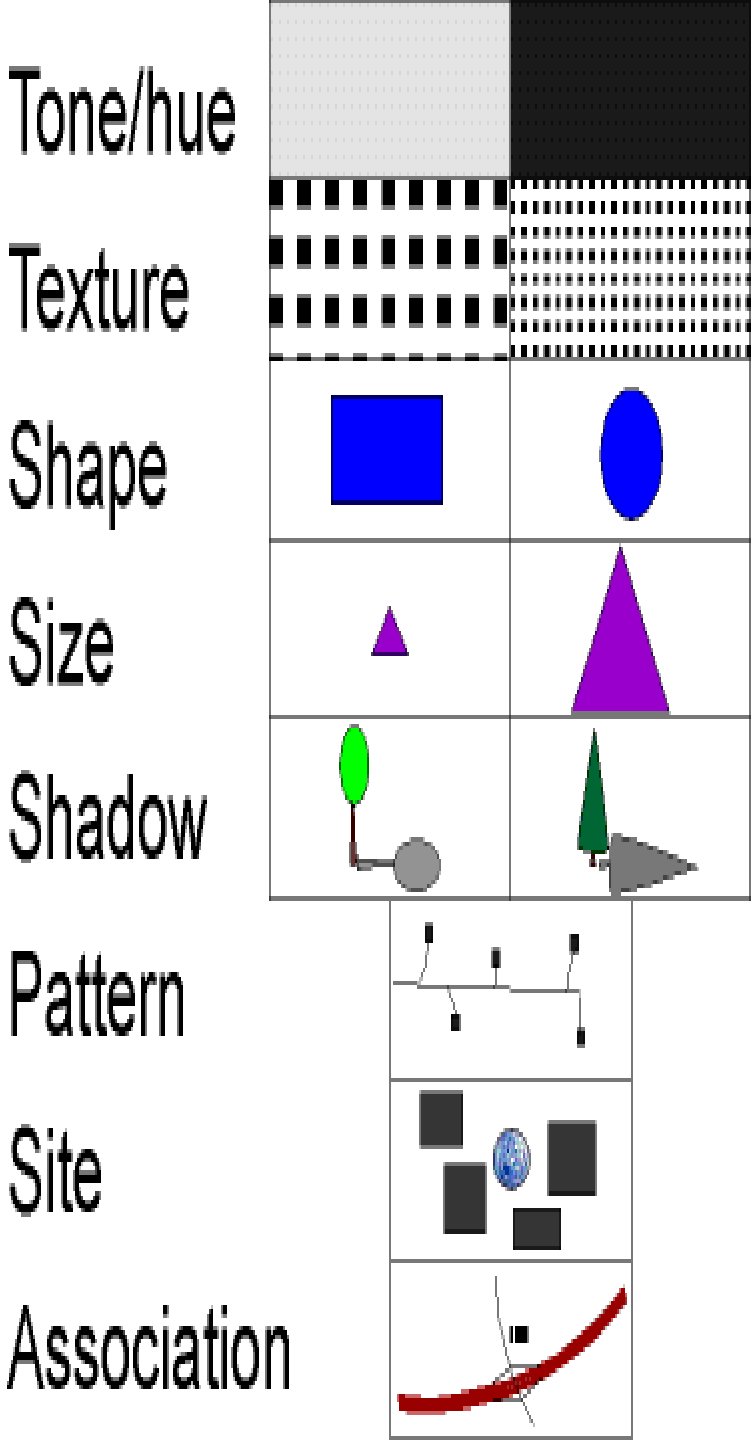
Size



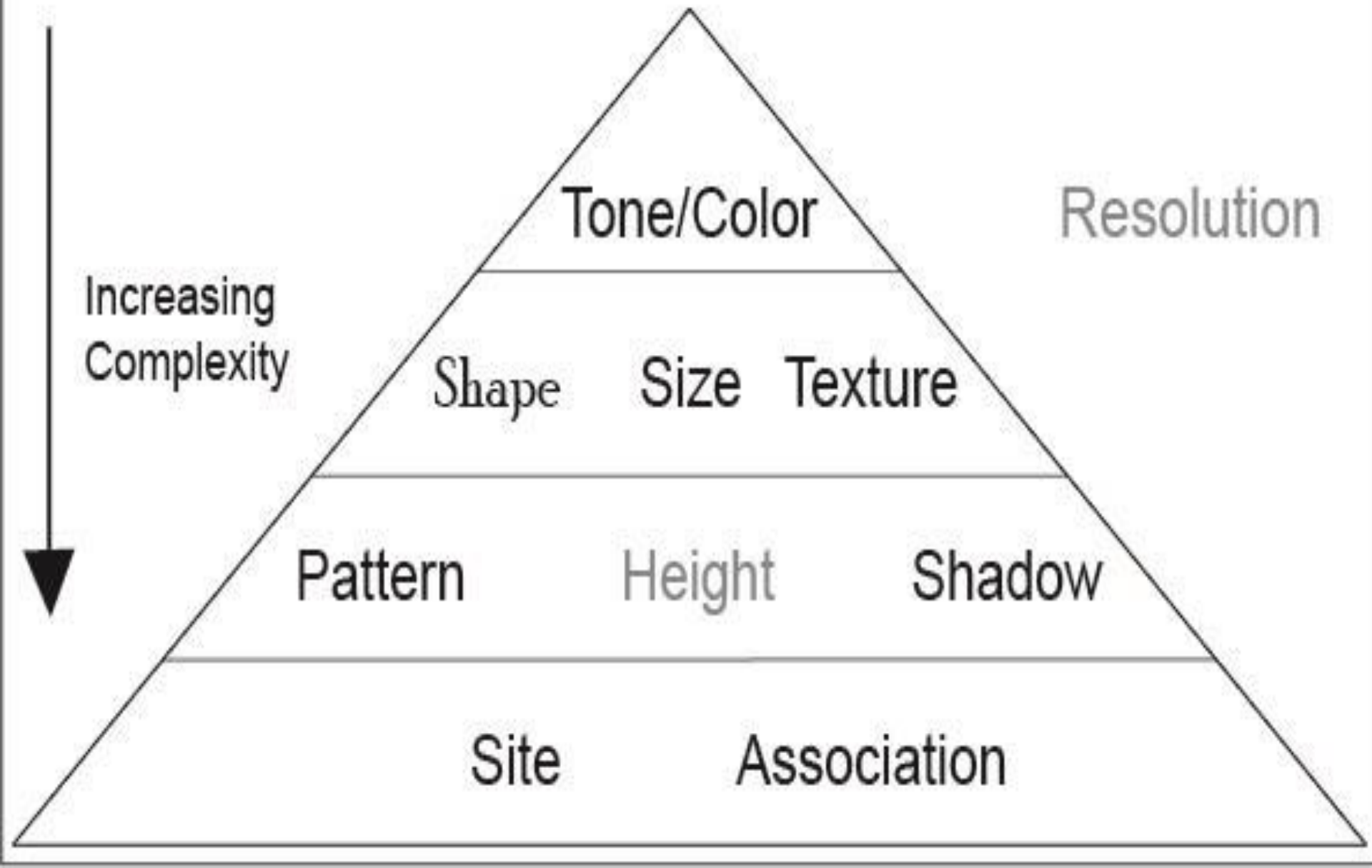
Association

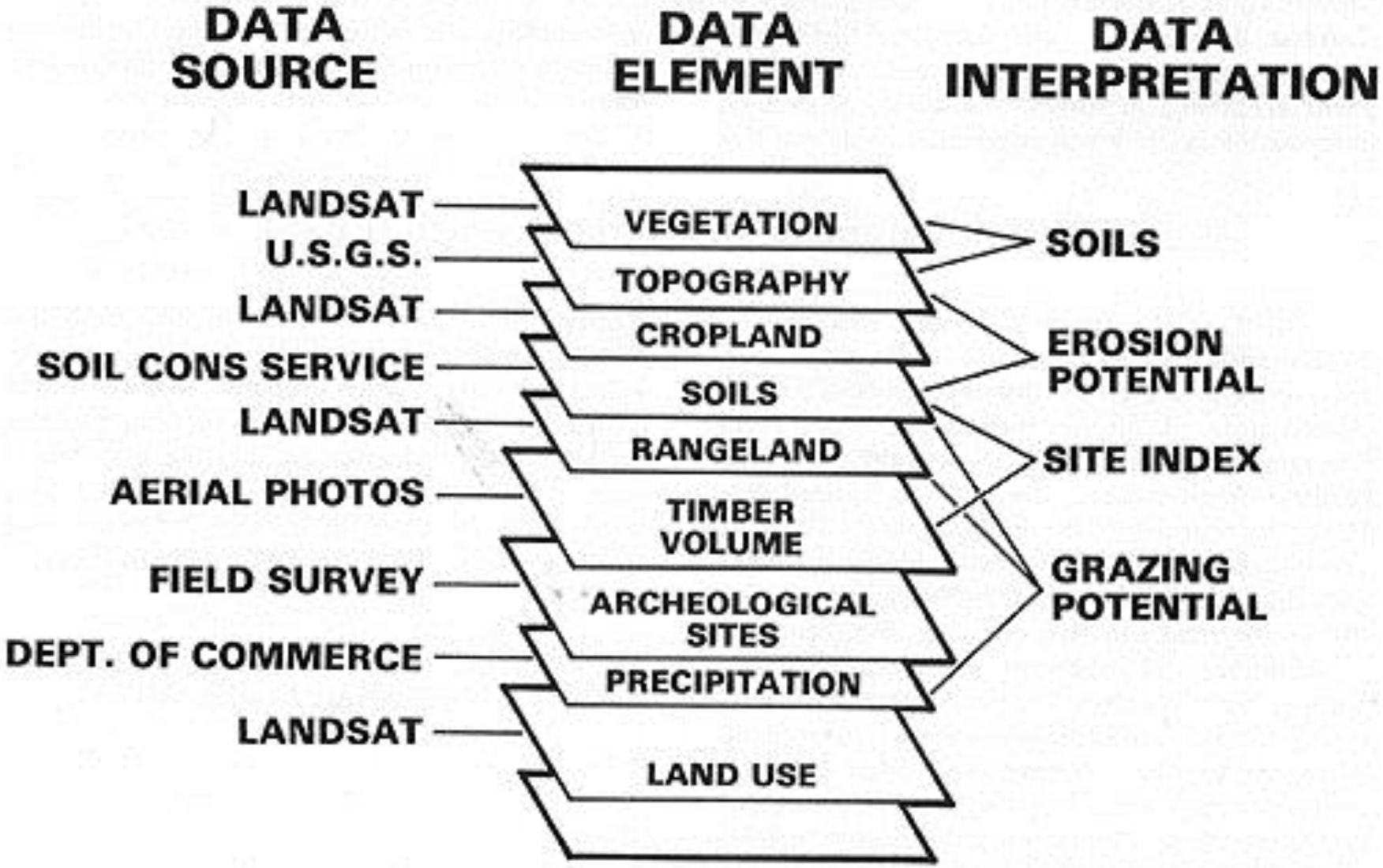


	What is it?	Example
Tone	Refers to the relative brightness or colour of objects in an image	Can distinguish between two crop fields due to different texture and shape of plants
Shape	Refers to the general form, structure, or outline of individual objects	Manmade objects tend to have straight edges, whereas natural objects have more irregular shapes
Size	**Size** of objects in an image is a function of scale	It is easy on an image to distinguish between a football stadium and a house
Pattern	Refers to the spatial arrangement of visibly discernible objects	In a housing estate, although individual houses cannot be made out, the recognisable pattern its produced
Texture	Refers to the arrangement and frequency of tonal variation in particular areas of an image	Different textures will appear differently on an image, for example, a sandy clearing within a forest will show up on the image
Shadow	May provide an idea of the profile and relative height of a target or targets which may make identification easier.	Shadow allows for identification of topographical landforms
Association	**Association** takes into account the relationship between other recognizable objects or features in proximity to the target of interest	Boats cannot be made out on their own within an image, however when in a marina, their proximity allows for identification



Nine Image Interpreation Elements Proposed by Charles Olson, Jr. (1960)




DATA SOURCE
DATA ELEMENT
DATA INTERPRETATION
LANDSAT
U.S.G.S.
LANDSAT
SOIL CONS SERVICE
LANDSAT
AERIAL PHOTOS
FIELD SURVEY
DEPT. OF COMMERCE
LANDSAT
VEGETATION
TOPOGRAPHY
CROPLAND
SOILS
RANGELAND
TIMBER VOLUME
ARCHEOLOGICAL SITES
PRECIPITATION
LAND USE
SOILS
EROSION POTENTIAL
SITE INDEX
GRAZING POTENTIAL

TONE **refers to the relative brightness or colour of objects in an image. Generally, tone is the fundamental element for distinguishing between different targets or features. Variations in tone also allows the elements of shape, texture, and pattern of objects to be distinguished.**

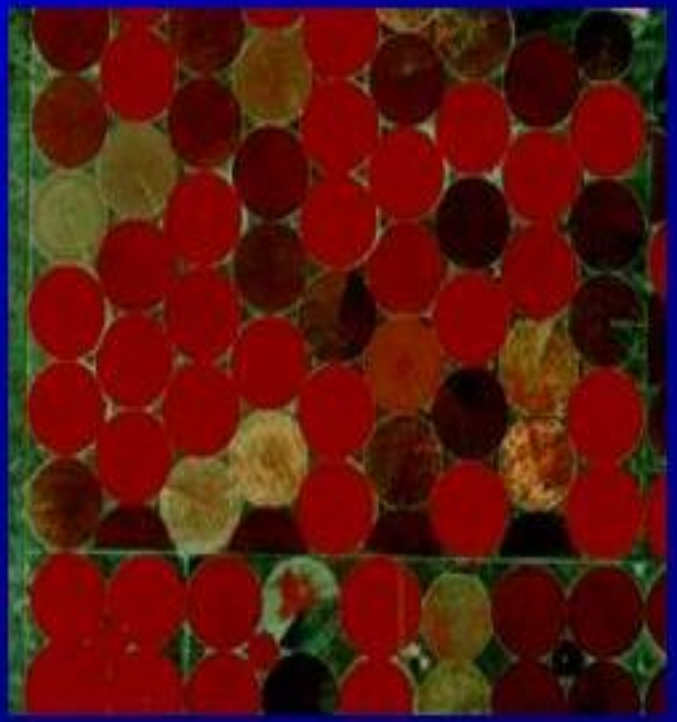
- Color/Tone
  - irrigated vs. dry fields, coniferous vs. deciduous trees

An algae bloom in color

An algae bloom in CIR

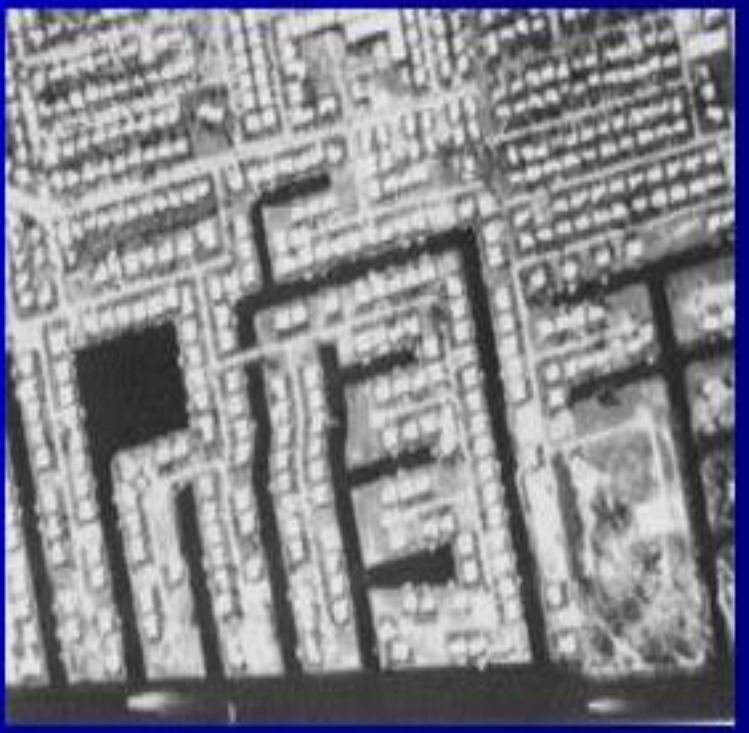
SHAPE **refers to the general form, structure, or outline of individual objects. Shape can be a very distinctive clue for interpretation. Straight edge shapes typically represent urban or agricultural (field) targets, while natural features, such as forest edges, are generally more irregular in shape,**

- Shape
  - cultural features - geometric, distinct boundaries
  - natural features - irregular shapes and boundaries
  - Shape helps us distinguish old vs. new subdivisions, some tree species, athletic fields, etc.



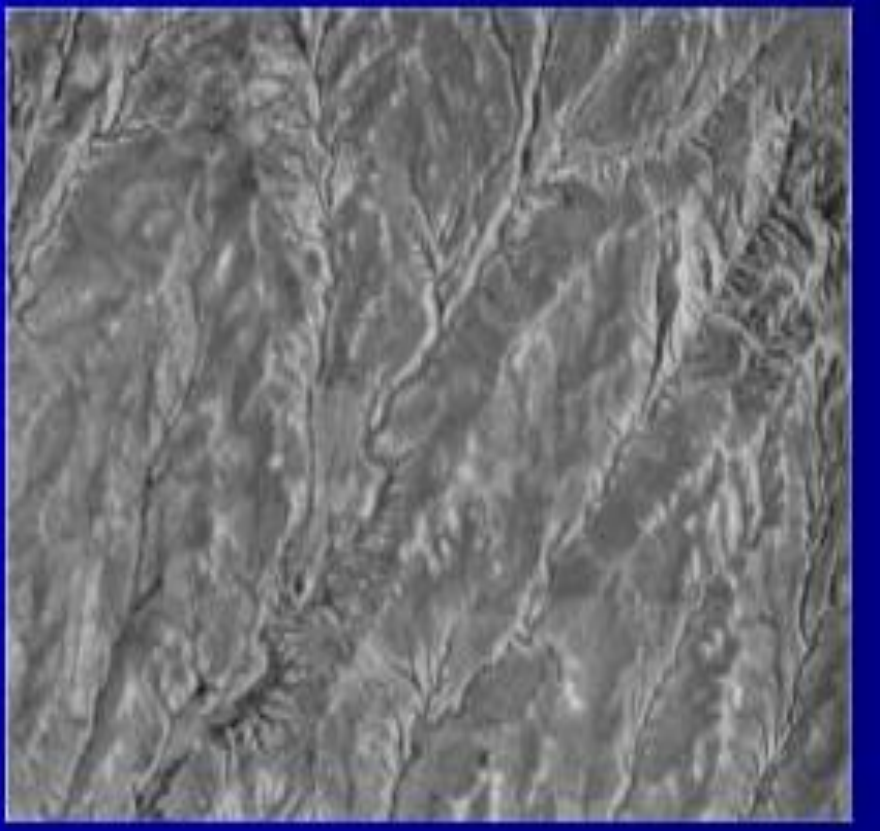
SIZE of objects in an image is a function of scale. It is important to assess the size of a target relative to other objects in a scene to aid in the interpretation of that target.

- Size
  - relative size is an important clue
  - apartments vs. houses
  - single lane road vs. multilane
  - horse tracks vs. runner's tracks



PATTERN **refers to the spatial arrangement of visibly discernible objects. Typically an orderly repetition of similar tones and textures will produce a distinctive and ultimately recognizable pattern. Orchards with evenly spaced trees, and urban streets with regularly spaced houses are good examples of pattern**

- Pattern
  - overall spatial form of related features
  - repeating patterns tend to indicate cultural features - random = natural
  - drainage patterns can help geologists determine bedrock type



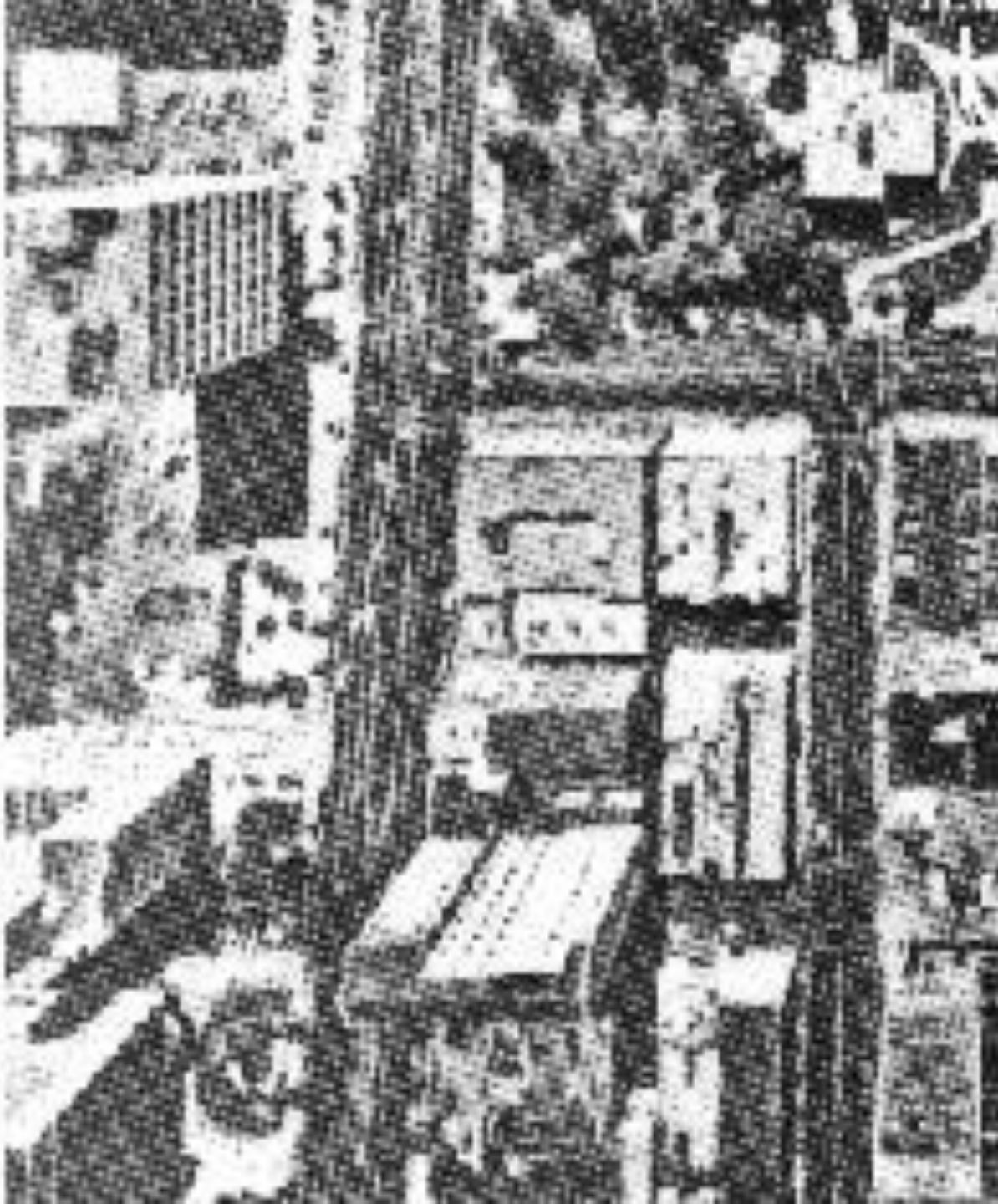
A dendritic pattern is characteristic of flat-lying sedimentary bedrock

TEXTURE refers to the arrangement and frequency of tonal variation in particular areas of an image. Rough textures would consist of a mottled tone where the grey levels change abruptly in a small area, whereas smooth textures would have very little tonal variation. In the image, black spruce is characterized by a darker smoother tone than the surrounding aspen which is lighter tone and mottled.

- Texture
  - coarseness/smoothness caused by variability or uniformity of image tone or color
  - smoothness - crops, bare fields, water, etc.
  - coarseness - forest, lava flows, etc.
  - even-aged vs. old growth

Helyer Woods and points south

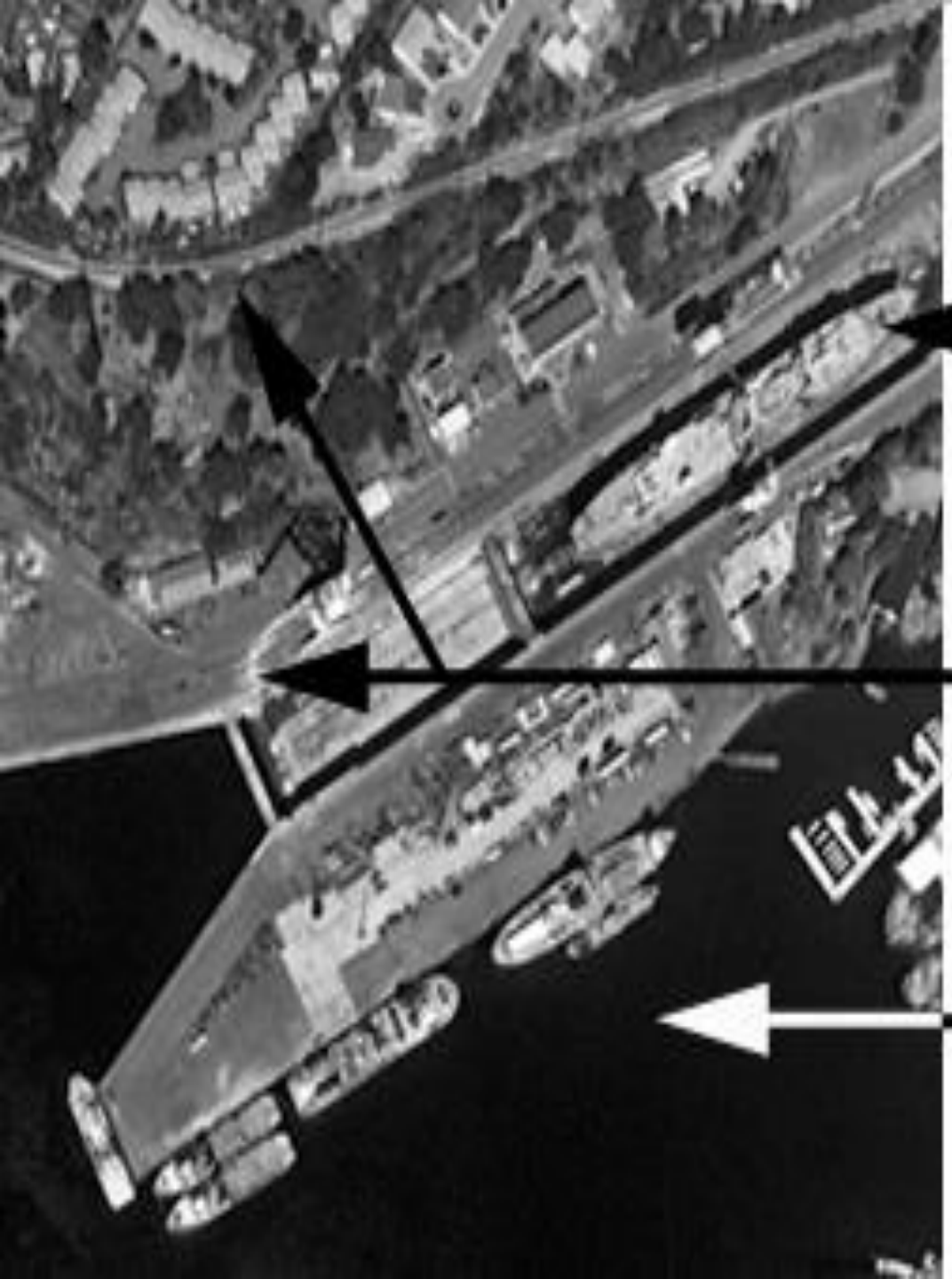
SHADOW is also helpful in interpretation as it may provide an idea of the profile and relative height of a target or targets which may make identification easier



Shadows

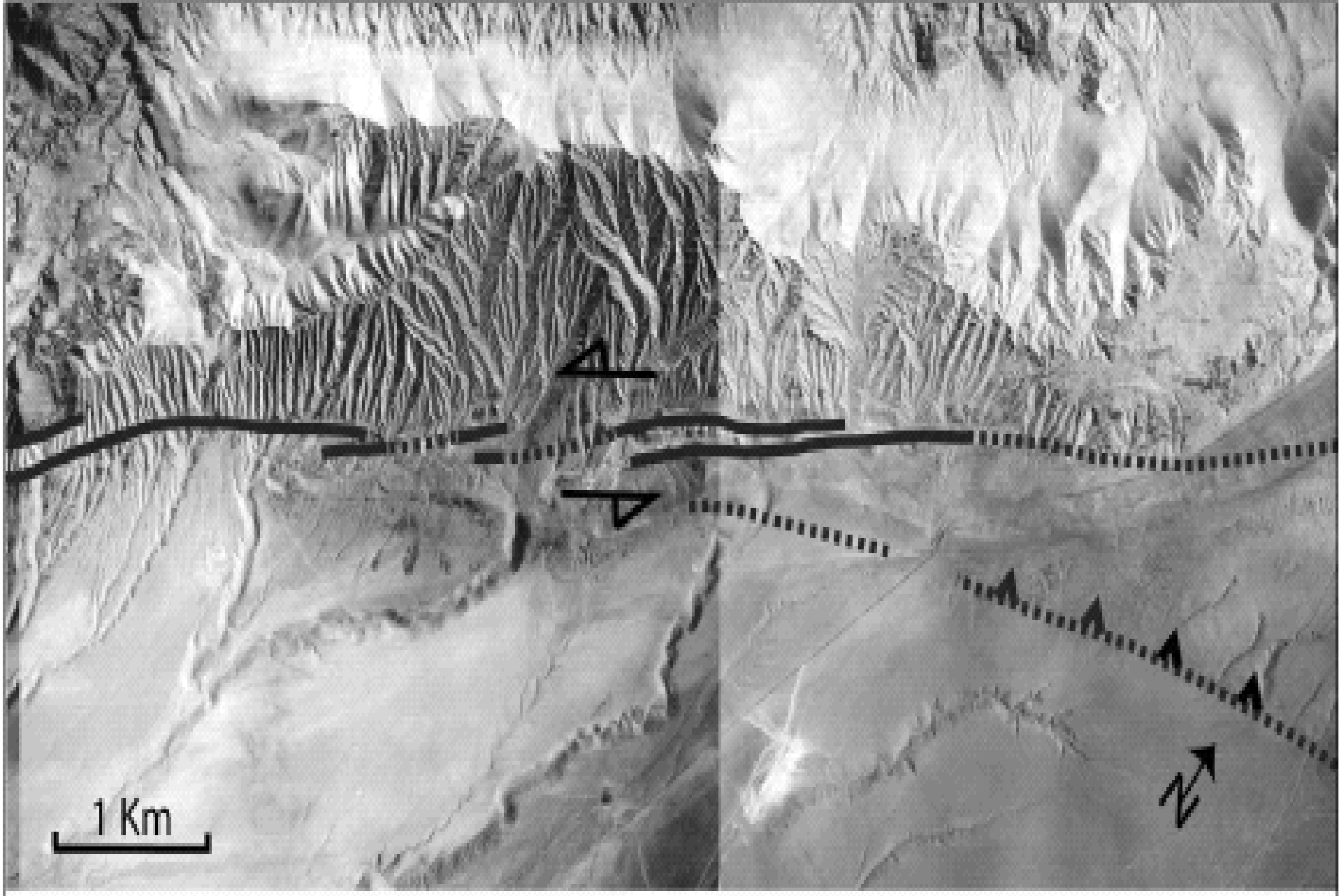
- shadows cast by some features can aid in their i.d.
- some tree types, storage tanks, bridges can be identified in this way
- shadows can also accentuate terrain

ASSOCIATION takes into account the relationship between other recognizable objects or features in proximity to the target of interest. The identification of features that one would expect to associate with other features may provide information to facilitate identification.

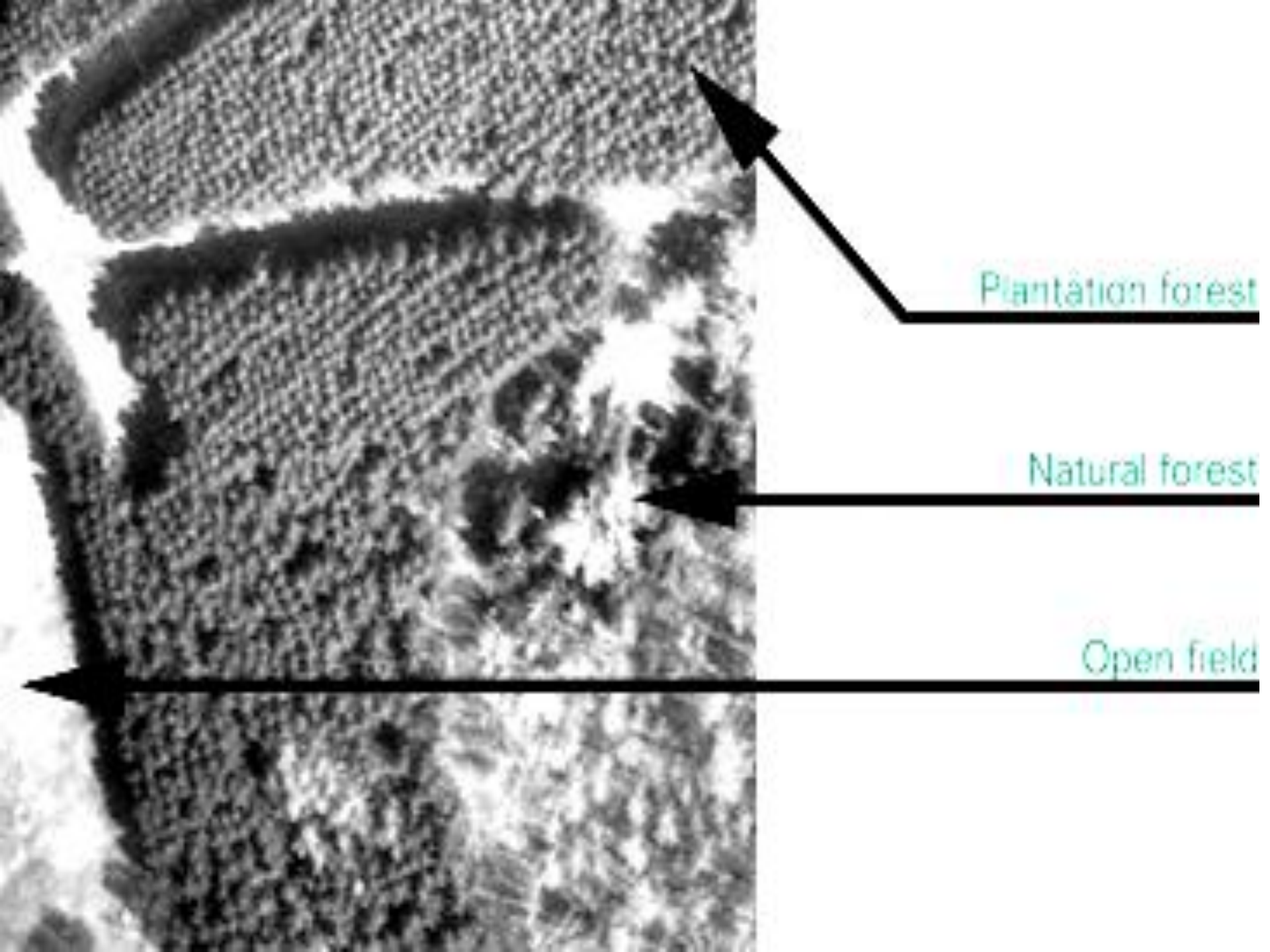

Dry-dock and ship
Railway tracks
Water (harbour)

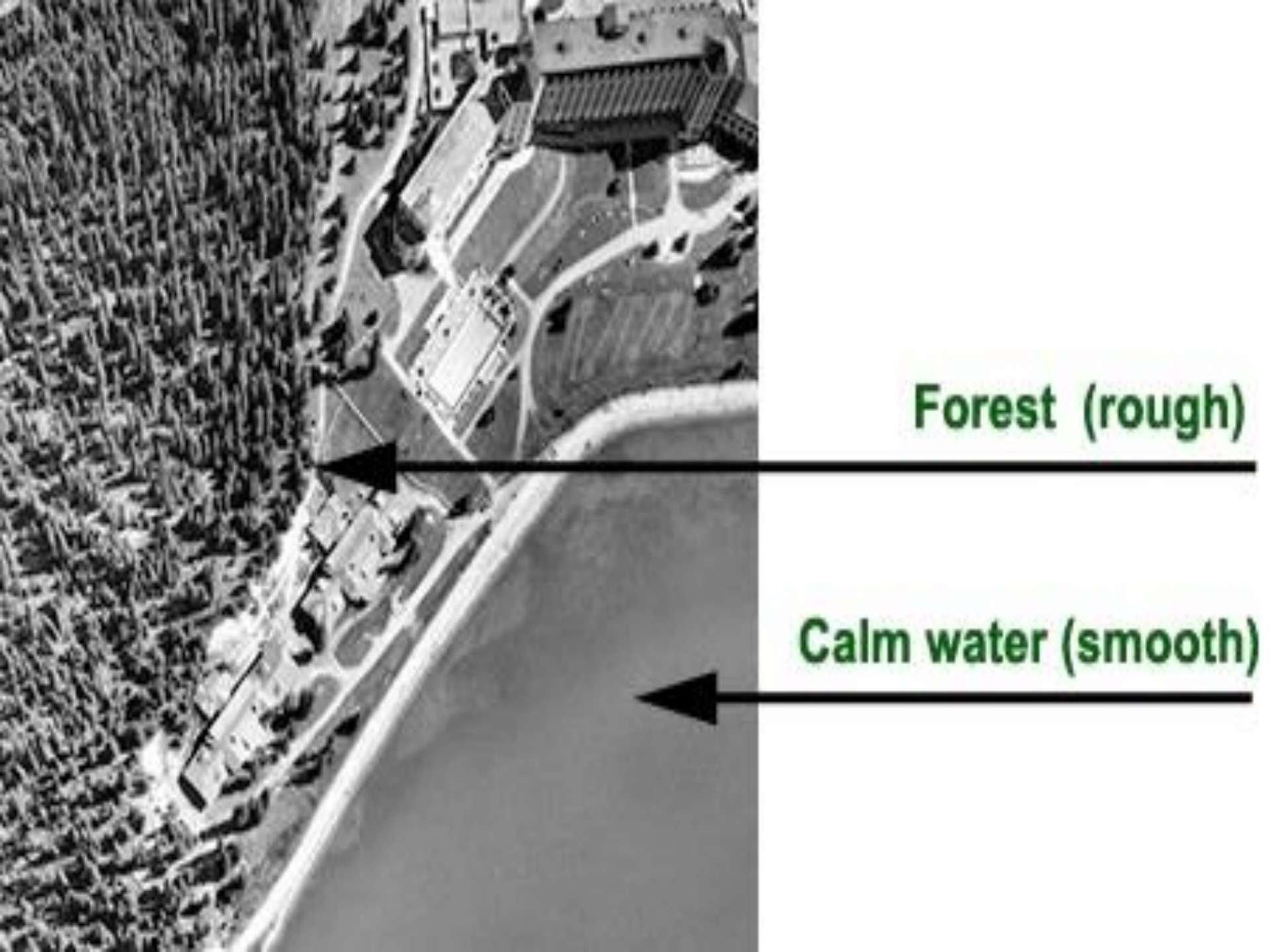
'U'-shaped oxbow lakes

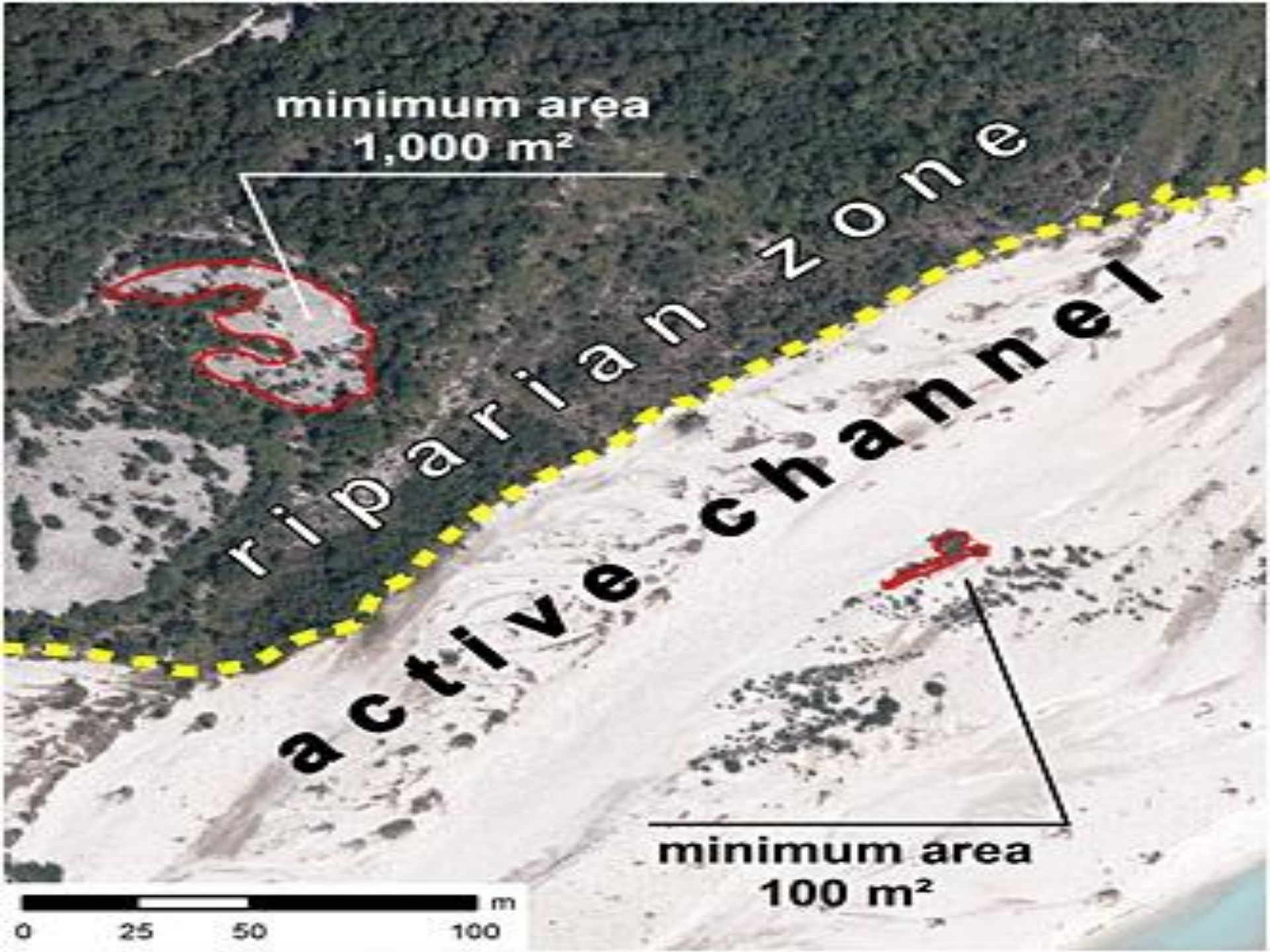
Chichaga River (Alberta)


1 Km
Main Fault segments , en echelon disposed
Horsetail termination, reverse fault system


Residential street
Multi-lane highway


Plantation forest
Natural forest
Open field


Forest (rough)
Calm water (smooth)

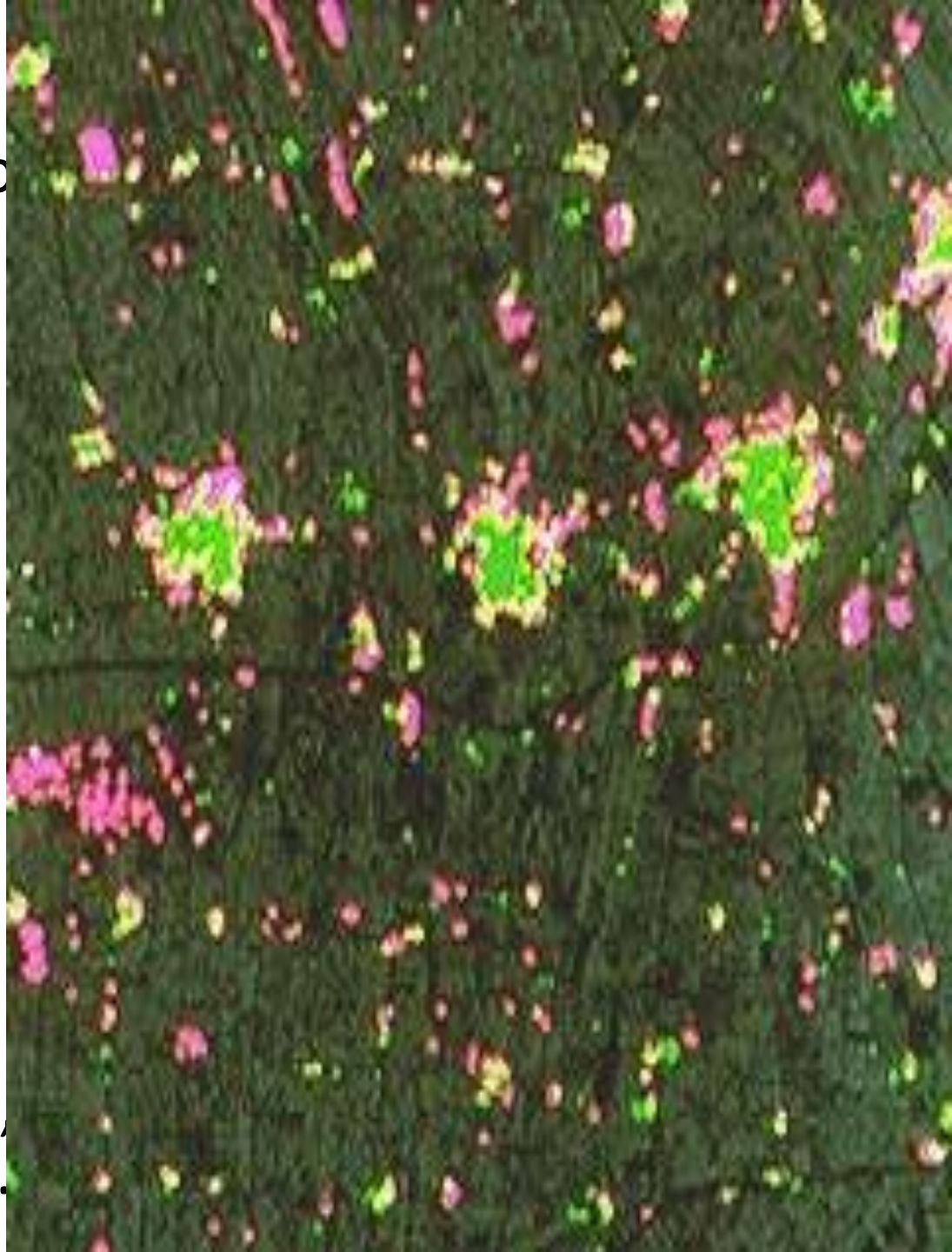

minimum area
1,000 m²
riparian zone
active channel
minimum area
100 m²
m
0
25
50
100

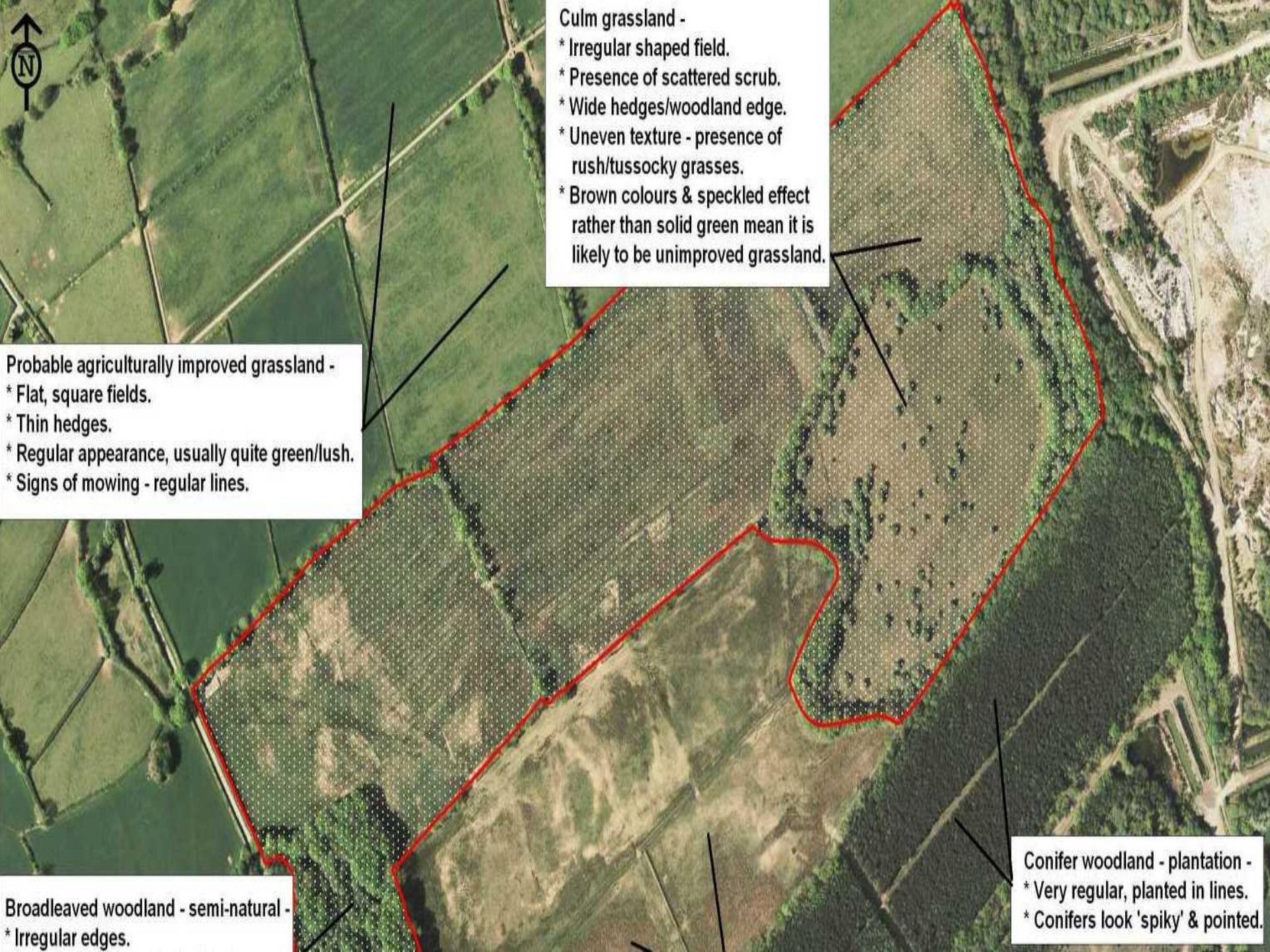
Change Detection

One of the important features of aerial photography and satellite remote sensing is the ability to detect changes on the Earth's surface through time. Airphotos and satellite images taken of the same location separated by several years can provide a way of estimating cultural, physical and environmental changes.

MONITORING CHANGES IN FOREST COVER: In the two false color satellite images taken of the same location, it is possible to estimate the increase in forest clear cutting between 1984 and 1991. Pink areas are cutovers, dark green is forested, light green is replanted or new growth.

- ***Urban Change:*** By incorporating information from two satellite images designed to classify urban areas, it possible to demonstrate and approximate the increase in urban growth between 1973 and 1985 (selected area of Egypt). The green delineates those areas of urban cover in 1973, and the pink, urban areas for 1985.




N
Culm grassland -
* Irregular shaped field.
* Presence of scattered scrub.
* Wide hedges/woodland edge.
* Uneven texture - presence of rush/tussocky grasses.
* Brown colours & speckled effect rather than solid green mean it is likely to be unimproved grassland.
Probable agriculturally improved grassland -
* Flat, square fields.
* Thin hedges.
* Regular appearance, usually quite green/lush.
* Signs of mowing - regular lines.
Broadleaved woodland - semi-natural -
* Irregular edges.
Conifer woodland - plantation -
* Very regular, planted in lines.
* Conifers look 'spiky' & pointed.

- ***Physical Landscape Change***: Landscapes change over time due to the action of wind, rain, water. This is particularly true along coastal areas where rivers carrying sediment enter the ocean, and are affected by wave action and ocean currents. In the following example one airphoto was taken in 1938 and the other in 1962. Note both the cultural and landscape (geomorphological) changes.