Final Exam Study Questions

The following are practice final exam questions for all post mid-term content. For pre mid-term content, see the mid-term practice questions.

The Resolutions

1. Give a definition of spatial resolution.
2. What are the three components of spectral resolution?
3. What is the first Landsat satellite?
4. Approximately how long does the Landsat record go back in time?
5. What is something very high spatial resolution satellite imagery can observe (that coarse/moderate imagery could not)?
6. Give two examples of objects or phenomena that can be observed at each of the following spatial resolutions: 1km, 250m, 30m

Active Remote Sensing

1. Explain the difference between active and passive remote sensing.
2. What are 2 advantages and 2 disadvantages of active remote sensing technologies?
3. What portion of the EM spectrum is used by RADAR?
4. What three key components are used in a LiDAR remote sensing system?
5. What are the types of datasets frequently derived from Lidar (that we discussed in class)?

Biosphere

1. What is the biosphere?
2. What are the patterns of net and gross photosynthesis as temperature increases?
3. What are the inputs to photosynthesis?
4. Give an example of a carbon source and carbon sink. What causes each example to be a source or sink?
5. Give an example of a *dynamic* carbon source/sink (i.e. something that can be both a sink and a source)

Cryosphere

1. How was the cryosphere monitored historically (before satellites)?
2. List 2 factors that influence the spectral reflectance of snow/ice.
3. What is the difference between Landsat and MODIS imagery compared to RADAR and LIDAR for looking at snow?
4. Choose one of the sensors covered in class, and explain how it senses cryospheric features and/or phenomena. What are some applications of the data this sensor gathers?

Oceans

1. How was sea surface temperature measured prior to satellite data?

2. Which satellites did we discuss in class that are used for sea surface temperature measurements? How do those satellites differ?
3. What satellites have been used for sea level measurements?
4. Why is Lidar useful for mapping salmon habitat units?

Wildlife

1. How was animal movement monitored historically? Is that data still useful?
2. What are the two approaches behind tracking animal movement?
3. How are GPS collars removed from tracked animals?
4. Explain how we can use satellite data such as Landsat to characterize animal habitat (i.e. what can of characteristics do we often quantify)?
5. What are the advantages to using satellite imagery to quantify animal habitat over traditional methods?
6. What has recent research from West Central Alberta using GPS collars and Landsat data shown about grizzly bear habitat preferences?

Observing the Human Footprint

1. Describe the human footprint. How do we quantify it? Why is it difficult to quantify?
2. Why is aerial photography a good way to assess the impact of human development?
3. How can nightlights be related to the human footprint? Using what socio/economic variables?
4. What might you expect to see from a nightlight image of western Canada?

Monitoring Change from Space

1. What are the 4 data considerations you need to make when using remote sensing to assess environmental change? Explain each.

Cyclical patterns, abrupt and gradual changes

1. Label the following changes as cyclical, abrupt, or gradual
   a. Animal migration _____
   b. Broadleaf phenology _____
   c. Decline in forest health _____
   d. Fire _____
   e. Flowering of plants _____
   f. Shift north in animal range due to climate change _____
   g. Insect damage_____
   h. Land conversion from forest to a road_____
   i. Reforestation following the abandonment of a city block_____
2. Which spectral signature might you see before a fire, and which might you see after a fire?
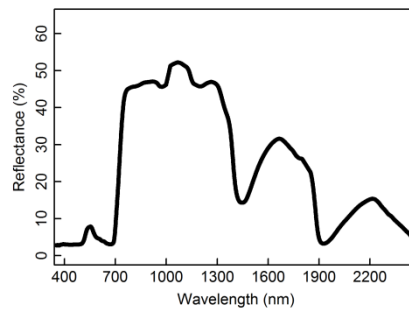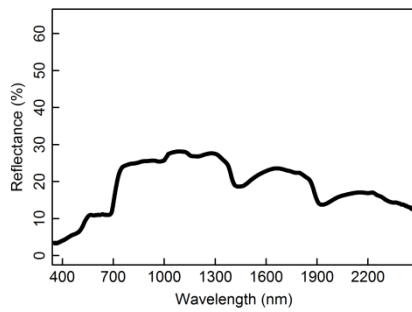
3. What data source is best for locating active fires?

4. What data source is best for mapping the total area burned in a year across British Columbia?

5. What is the easiest way to distinguish fire from harvest using Landsat imagery?

Label the following patterns/changes as plant phenology, fire, insect disturbance, land conversion (forest converted to a road), or reforestation.
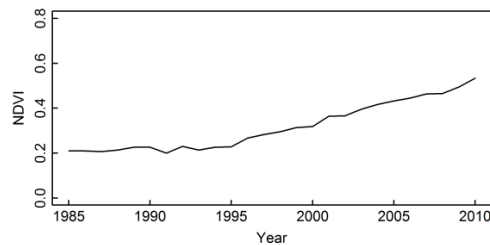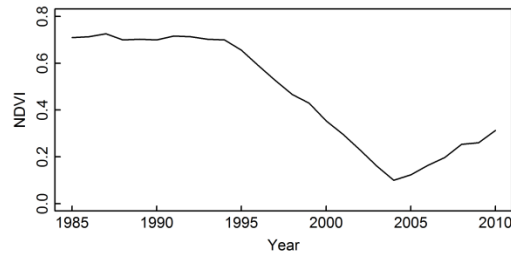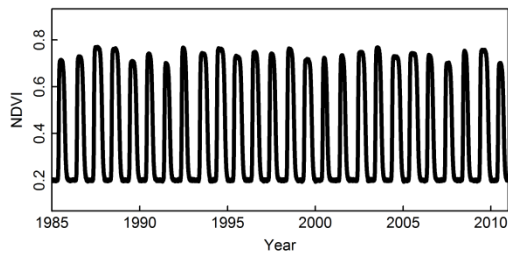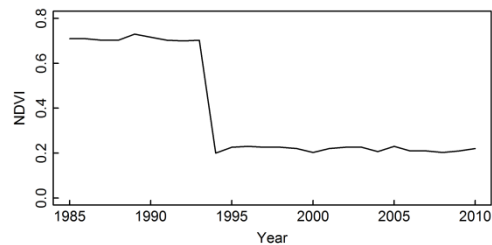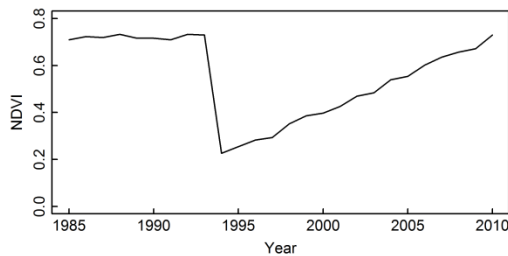
6. True or false: When a broadleaf tree puts on leaves in the spring, more blue and red light is absorbed by the tree

7. Do insect outbreaks appear as gradual or abrupt changes in satellite imagery? Explain why.
8. Describe how you can tell the difference in satellite imagery between a forest harvest and an area that was cleared to build a neighborhood.
9. List and describe the data requirements necessary to detect and monitor an insect outbreak in a forest from satellite data.
    a. What might be a suitable satellite to detect and monitor an insect outbreak in a forest?

The Future of Observing the Earth from Space

1. What is a constellation network of satellites?
2. Why are cubesats potentially useful as a future endeavour of earth observation?
3. What is the democratization of space?
4. Explain the issue of open skies.

Canada from Space

a) Name an ecozone in Canada

b) Describe an earth observation (and/or remote sensing) application specific to the environment in the ecozone, be sure to include:

   i. The unique feature of that ecozone (i.e. specific wildlife/vegetation/land cover/land use)

   ii. The specific process/phenomena that the earth observation data is being used to measure/monitor/detect

   iii. The specific satellite/sensor/dataset being used