Exploring The Earth With Remote Sensing

Purpose:

This quiz introduces students to the concepts of Remote Sensing, and challenges them to think about the human and physical processes at work that are changing the Earth's surface.
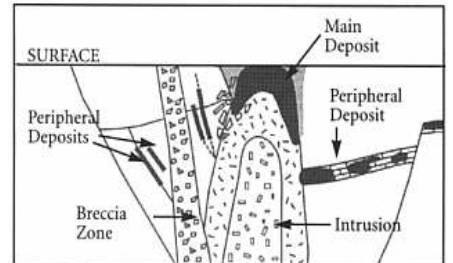
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Your Name:

Observing the earth from space using satellite images of the earth's surface is important for understanding the planet. Since 1972, the USGS has operated the Landsat ("Land-satellite") series of satellites to understand the earth in terms of global climate change, agriculture, forestry, geology, resource management, geography, mapping, water quality, and oceanography.

Landsat orbits at 705 kilometers and can visit the same area on the earth's surface every 16 days. The Landsat images that you will be observing in this event illustrate some dramatic changes in the Earth over the past 20 years.

The Landsat images used in this **Remote Sensing (or "From A Distance")** event are color composite images created by assigning colors to bands in the electromagnetic spectrum. Some of the bands are in the visible spectrum, while others are in the infrared part of the spectrum.

The band combination makes vegetation appear as shades of red. Brighter reds indicate more vigorously growing vegetation. Soils with no vegetation or sparse vegetation range from white, indicating sands, to greens or browns, depending on soil moisture and the content of organic matter.

Water bodies appear blue or black. Deep, clear water will be dark blue to black in color, while water that is shallow or laden with sediment will appear lighter in color. Urban areas appear blue-gray in color. Clouds and snow appear bright white. Clouds will have a puffy or popcorn shape with shadows often apparent.

1. Based on the what you learned above, do these images show the Earth's surface in the same way as you'd see it if you were looking with the unaided eye from aboard the Landsat satellite?

2. Why or why not?

3. Based on what you learned above, are these Landsat images taken from higher or lower than aerial (airplane) photographs? Circle your answer. (1 point)

     Higher   Lower

4. Therefore, will each image cover more <u>terrain</u> or less terrain than aerial photographs do?

5. Will each image include more <u>detail</u> or less <u>detail</u> than aerial photographs do?

6. Will each image be a smaller map scale or larger map scale than aerial photographs?

7. Based on the sentences above, what color would most of Colorado Springs or Fort Collins appear on a Landsat image?

8. What color would most of the mountains west of Colorado Springs or Fort Collins appear on a Landsat image?

9. What color would the arid Colorado Plateau appear near Cortez, Colorado, on a Landsat image?

Examine the following 3 infrared images of a large city in the United States.

1972   1986   2000
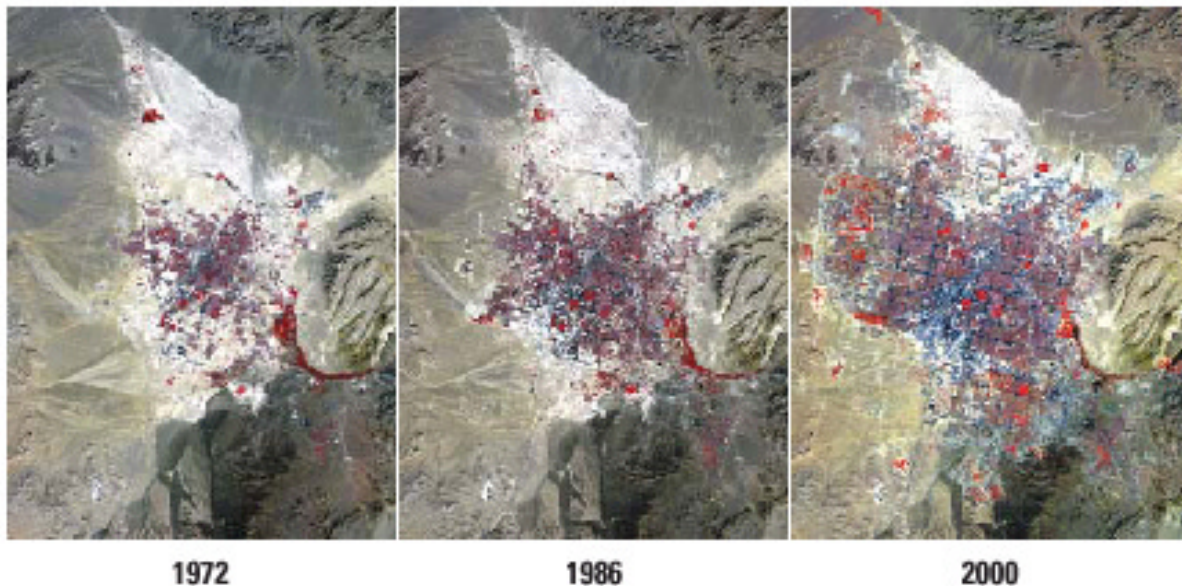
10. Circle your answer. This city is in the:

Mountain northwest   Desert southwest   Midwest   Northeast

11. Why did you answer the above question the way you did? Name two clues that the image gave you:

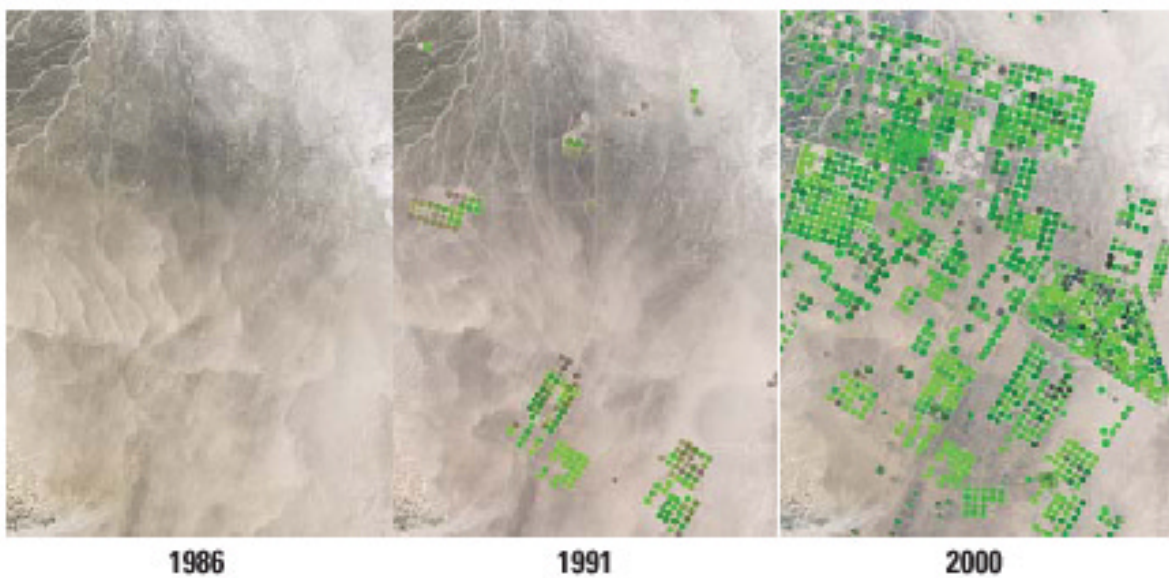12. In what direction will the city grow in the future?

13. Why did you answer the above question the way you did?

14. Can you name of this city, based on the evidence above? If so, name it:

15. This city's population is:

remaining the same   growing slowly   growing quickly

Examine the images below.

These images were taken over the northern Saudi Arabian desert near Al Isawiyah, near Jordan.

16. What are the circular areas in the image?

17. Do these circular areas exist in Colorado and on the Great Plains of the USA?

18. Why are the circles in the image becoming more numerous over time?

19. Is the above image in **natural color** or **color infrared**?   Circle your answer.

20. Explain why you answered the way you did to the above question.

Examine the following 5 aerial photographs of urban areas:

21. What is the predominant feature in the image above?

22. What is the predominant feature in the image above?

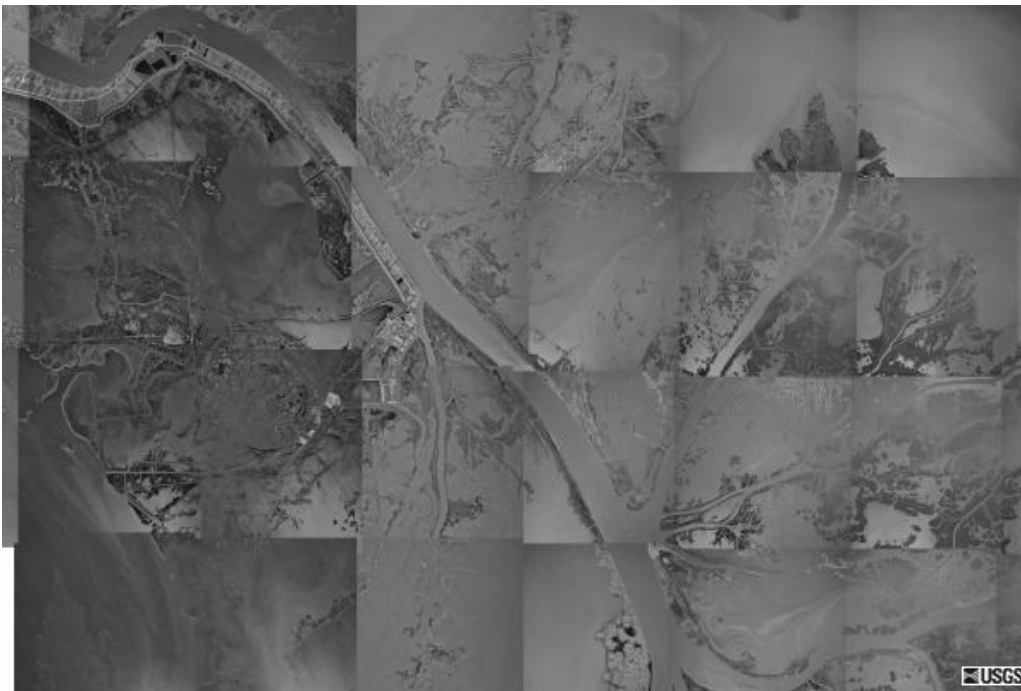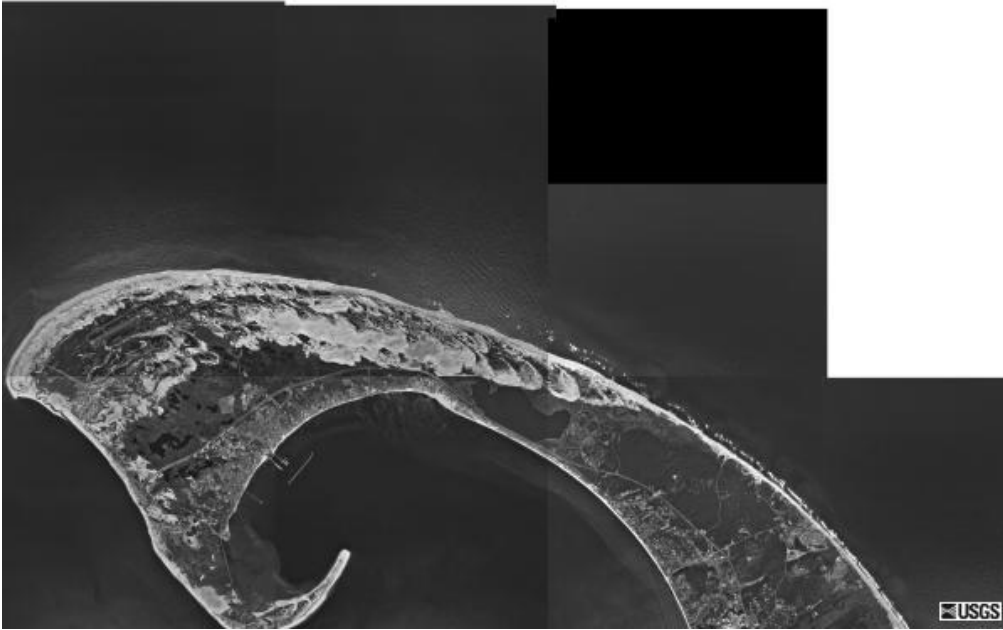23. What is the predominant feature in the image above?

24. What is the predominant feature in the image above?

25. What is the predominant feature in the image above?

Examine the following 5 aerial photographs of rural areas:

26. What is the predominant feature in the image above?

27. What is the predominant feature in the image above?

28. What is the predominant feature in the image above?

29. What is the predominant feature in the image above?

30. Why is this feature so bright?

31. What is the c-shaped feature in the image above?

32. Why is this c-shaped feature darker than the long feature that extends from the northwest to the southeast in a series of curves?
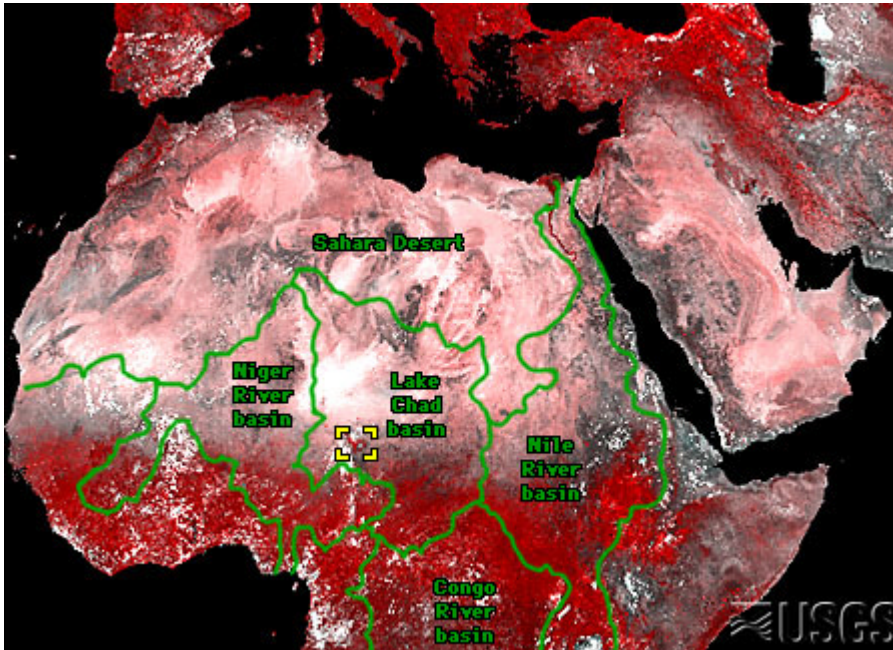
Examine the following images of Lake Chad, in Africa, from 1963 (top) to 1987 (bottom).
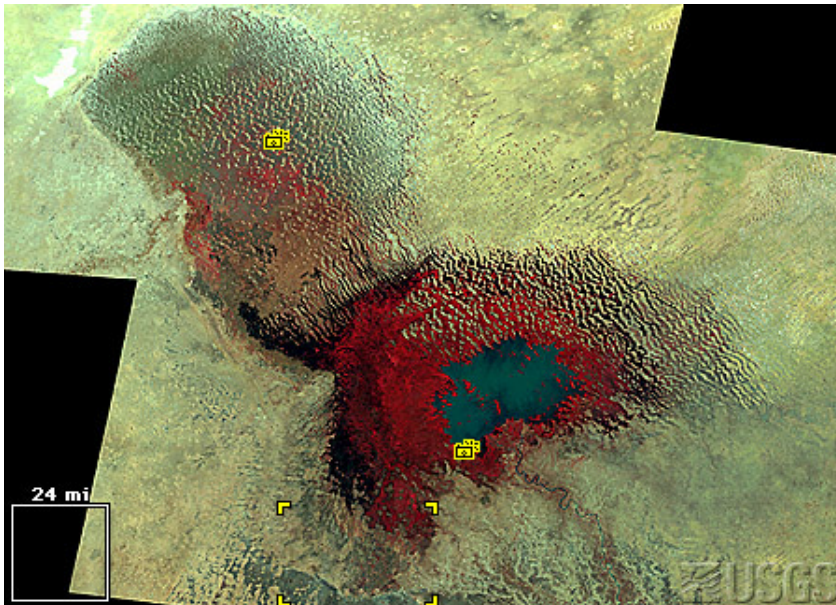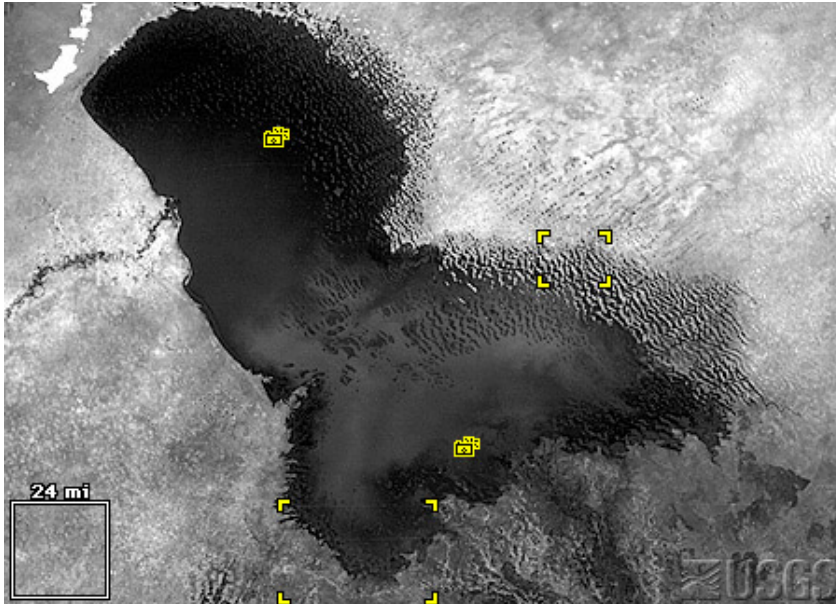
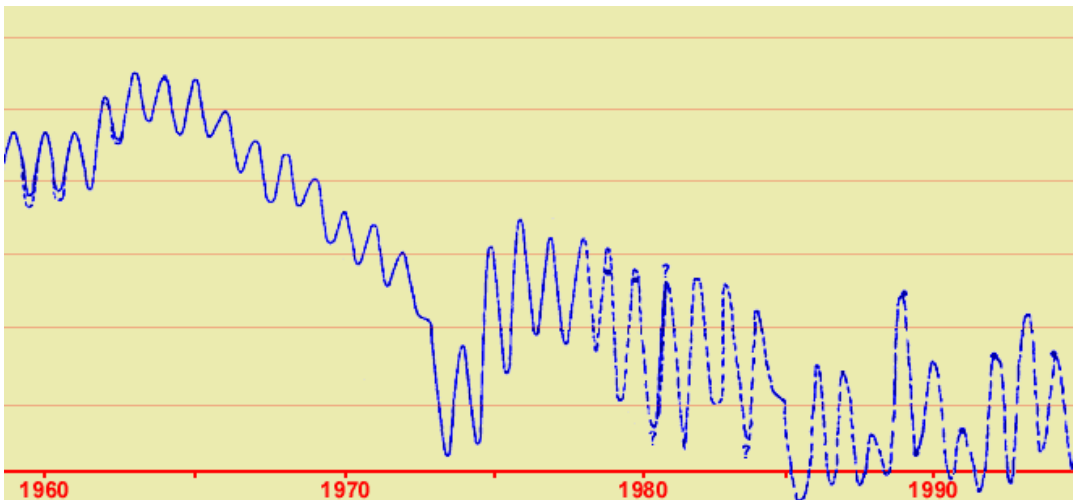33. What is happening to the lake?

34. Name two possible reasons why the lake could be changing in this way.

Examine the following image of northern Africa, with 4 yellow corners indicating Lake Chad's location.


35. From which direction do you think most of Lake Chad's water comes from?

36. Why?

37. Examine the above chart of the levels of Lake Chad over the past 45 years. Name a reason why the lake experiences highs and lows each year.

38. For thousands of years, people have transformed land cover by a method more powerful than building, planting, irrigating, grazing, draining, or poldering. The practice was also used by Native Americans on the Great Plains of the USA. You can see evidence for it in the image of the southeast side of Lake Chad, below. Name the practice.
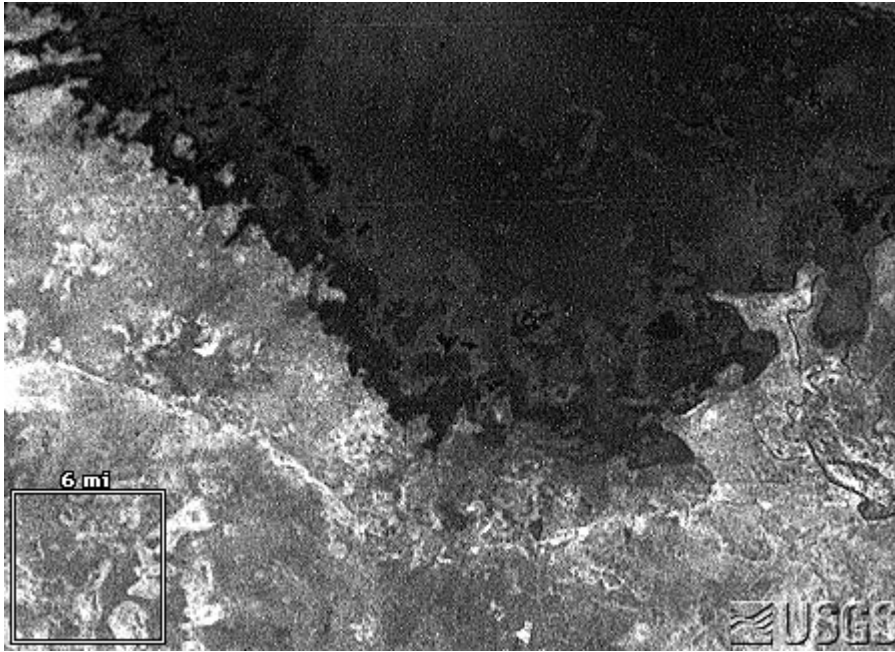
Examine the following two satellite images, taken during the 1960s (top) and the 1980s (bottom), particularly the south central portion.
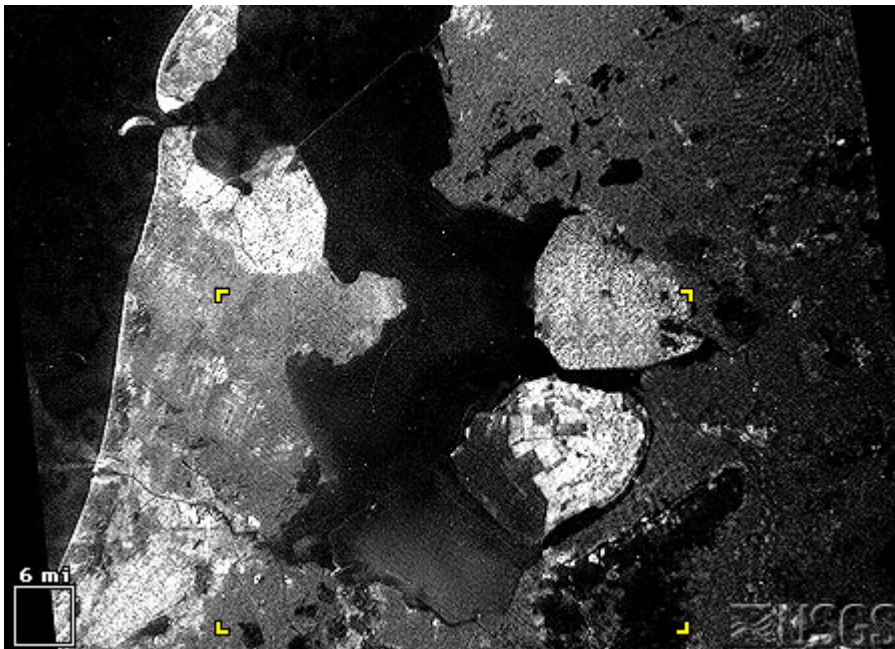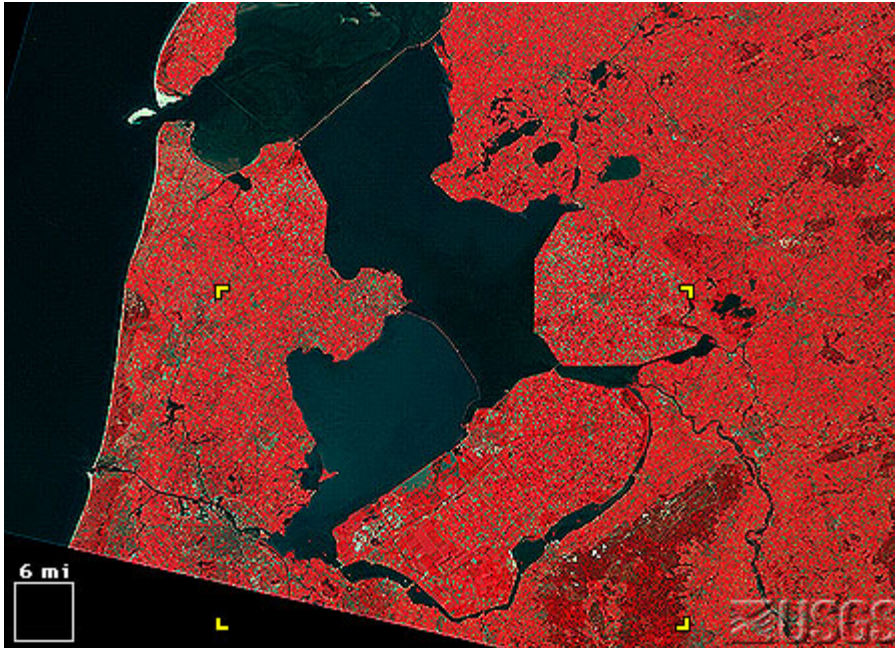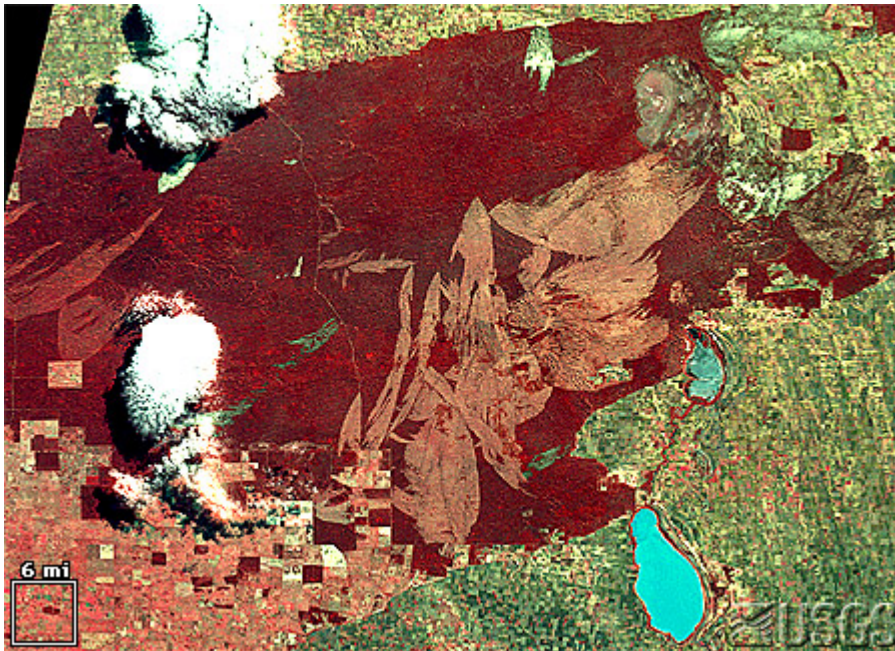
39. How is the land being modified here?

40. Name the country shown in these images.

Examine the following two satellite images, taken during 1975 (top) and 1985 (bottom) in Wyperfeld National Park, southeast Australia, in the state of Victoria. The park is native shrubland-- the Australian "bush".

Above are two ground images of heath and woodland in the park.

41. What color is the National Park on the Landsat images?

42. Why?

43. What color is cropland?

44. What phenomenon created the large areas in the park that in 1985 had changed color?

45. What time of day was the image taken? Circle your answer: Between:
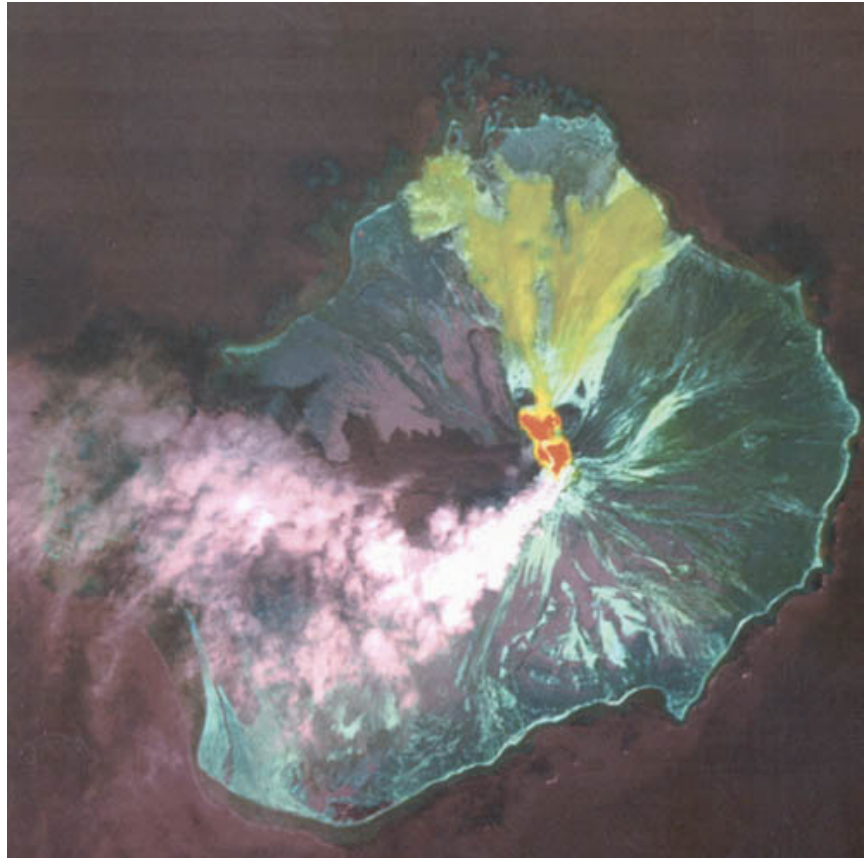
Midnight - 6am   6am - noon   Noon - 6pm   6pm -- Midnight

Examine the following image showing the Augustine Volcano in Alaska, taken in April of 1986, by the Landsat satellite, Thematic Mapper Sensor.

46. What direction is the lava flowing toward?

47. Two colors represent the lava's temperature. What are they?

48. Which of those colors is the hottest?

49. What direction is the wind blowing towards?

50. Assume north is at the top of the image. What time of day was the image taken?
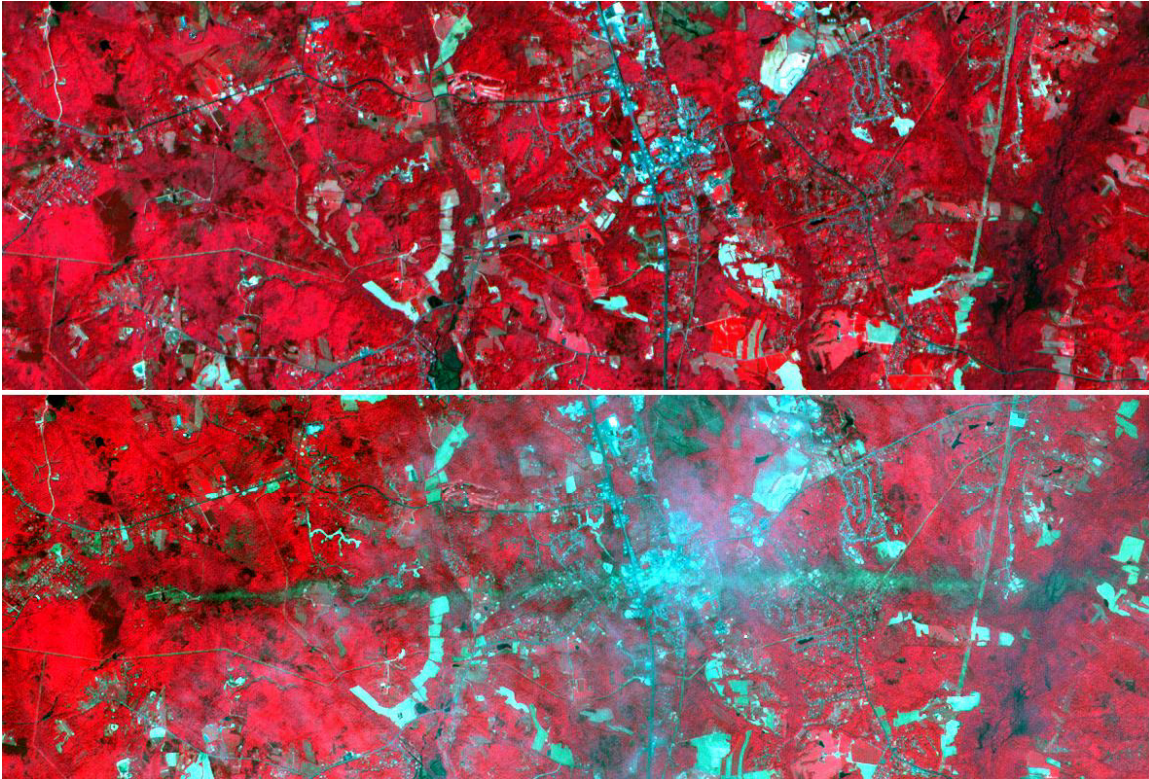
Midnight - 6am   6am - noon   Noon - 6pm   6pm -- Midnight

The two images below show a before and after scene of an urban area (Maryland) that was devastated by a tornado.

51. What part of this image (west or east) seems to have the largest concentration of development?

52. Below, circle the one that best suits the direction the tornado took:
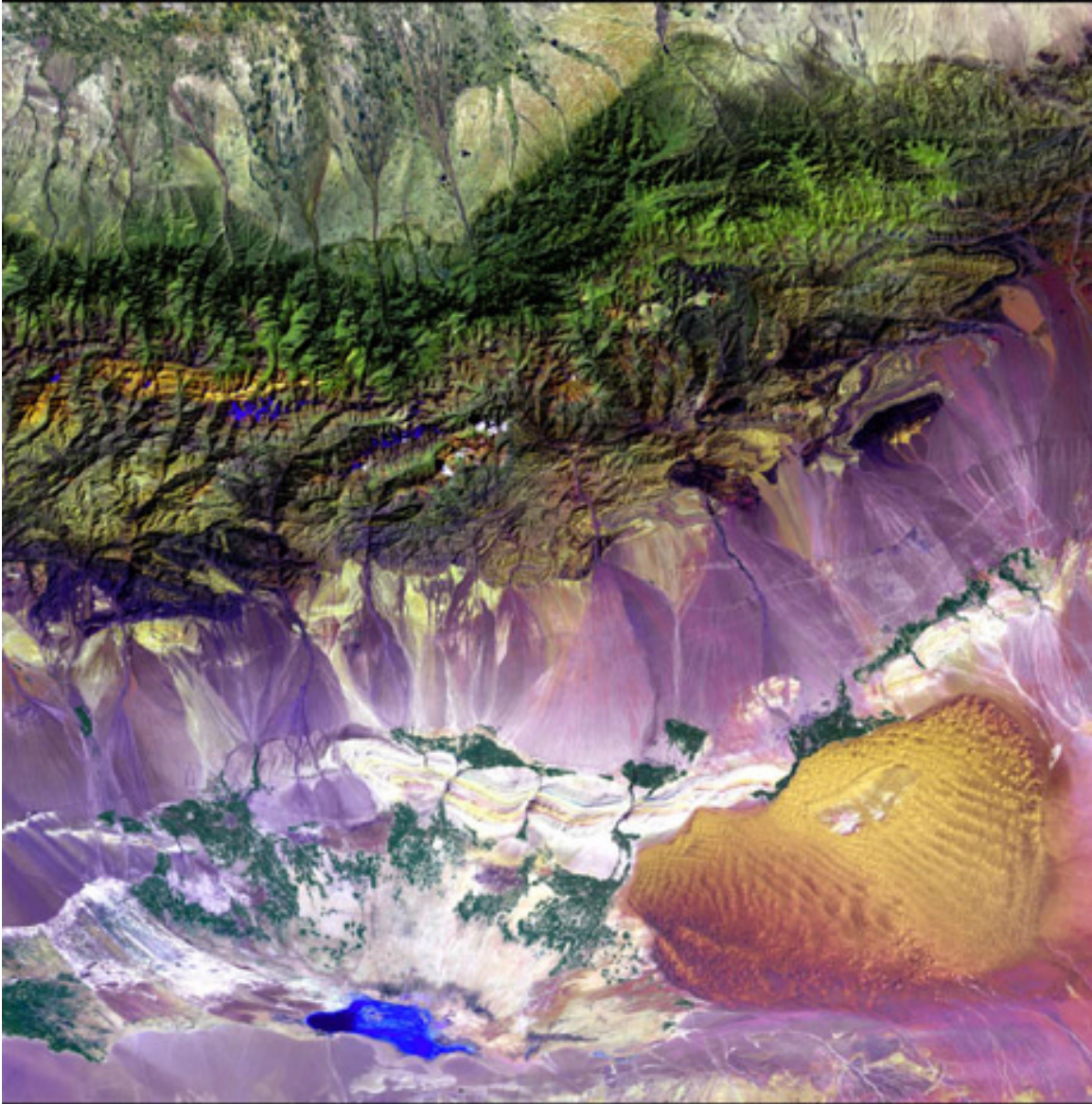
A. North to South

B. East to West

53. Judging by an addition of certain color, what area (west or east) received the most damage?

54. What was that color and what do think it represents?

The following image was taken in China Landsat 7 in September 1999.

55. What part of this image is the highest in elevation (north, central, south)?

56. What part of this image do you think receives the most precipitation (north or south)?

57. What corner would you find sand dunes? Circle your answer:

NE   NW   SE   SW

58. What color in this image would best represent the alluvial fans?

These Landsat images show a time line of land changes. This area lies east of Santa Cruz de la Sierra, Bolivia, in an area of tropical dry forest.
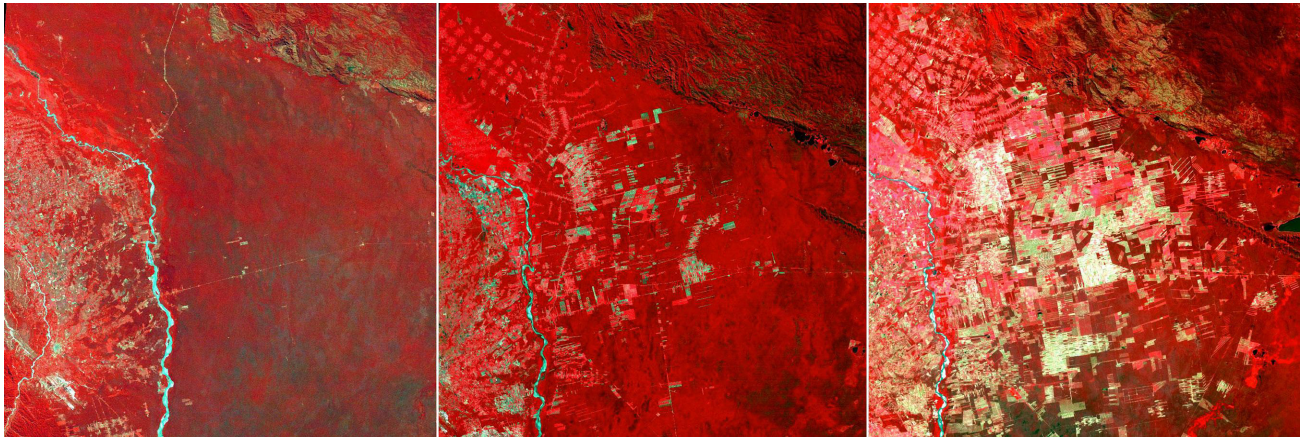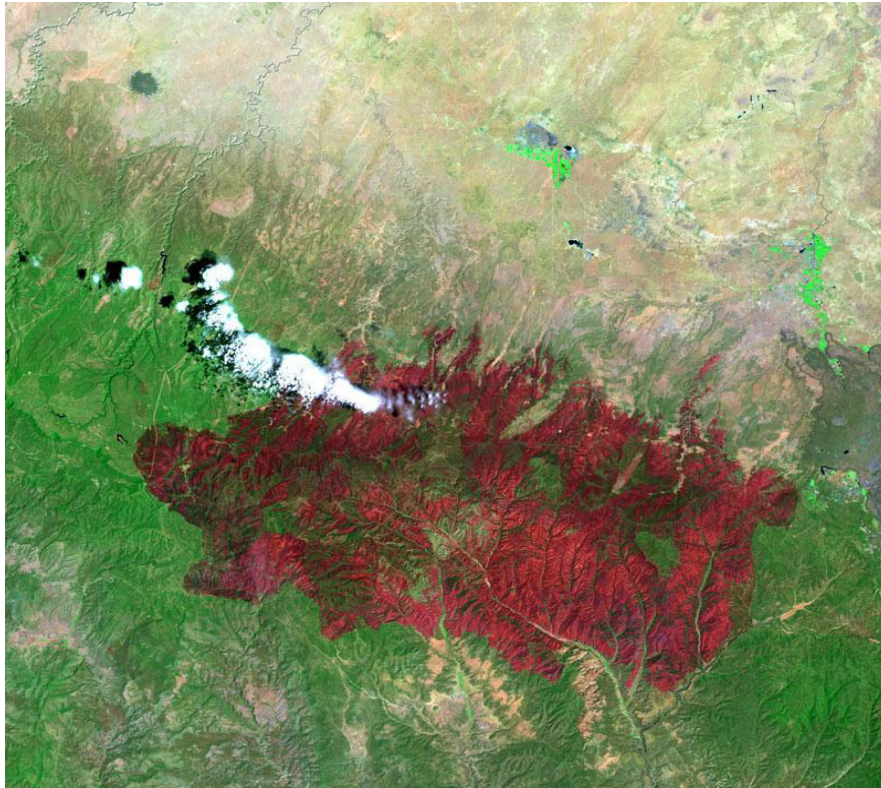

59. What predominant change do you think is occurring in this area?

60. What do the light colored squares represent?

The following Landsat image was taken June 21, 2002
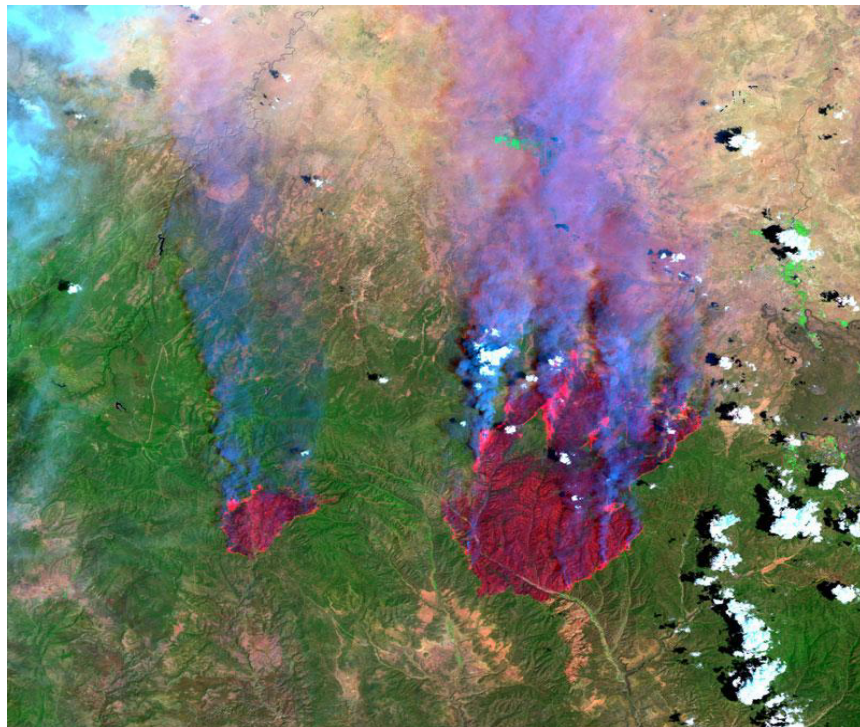
The following Landsat image taken in the same area was taken two weeks later on July 7, 2002.

61. What natural disaster happened here?

62. What color represents this disaster?

63. In the first image of this set, what does the purple represent?

Remote Sensing uses many parts of the electromagnetic spectrum; the most common as you have seen is visible light and near infrared. Below is an image that uses the _thermal_ and infrared part of the spectrum. This image shows the temperature of water around the San Francisco / Oakland bay area and blacks out all of the surface land.
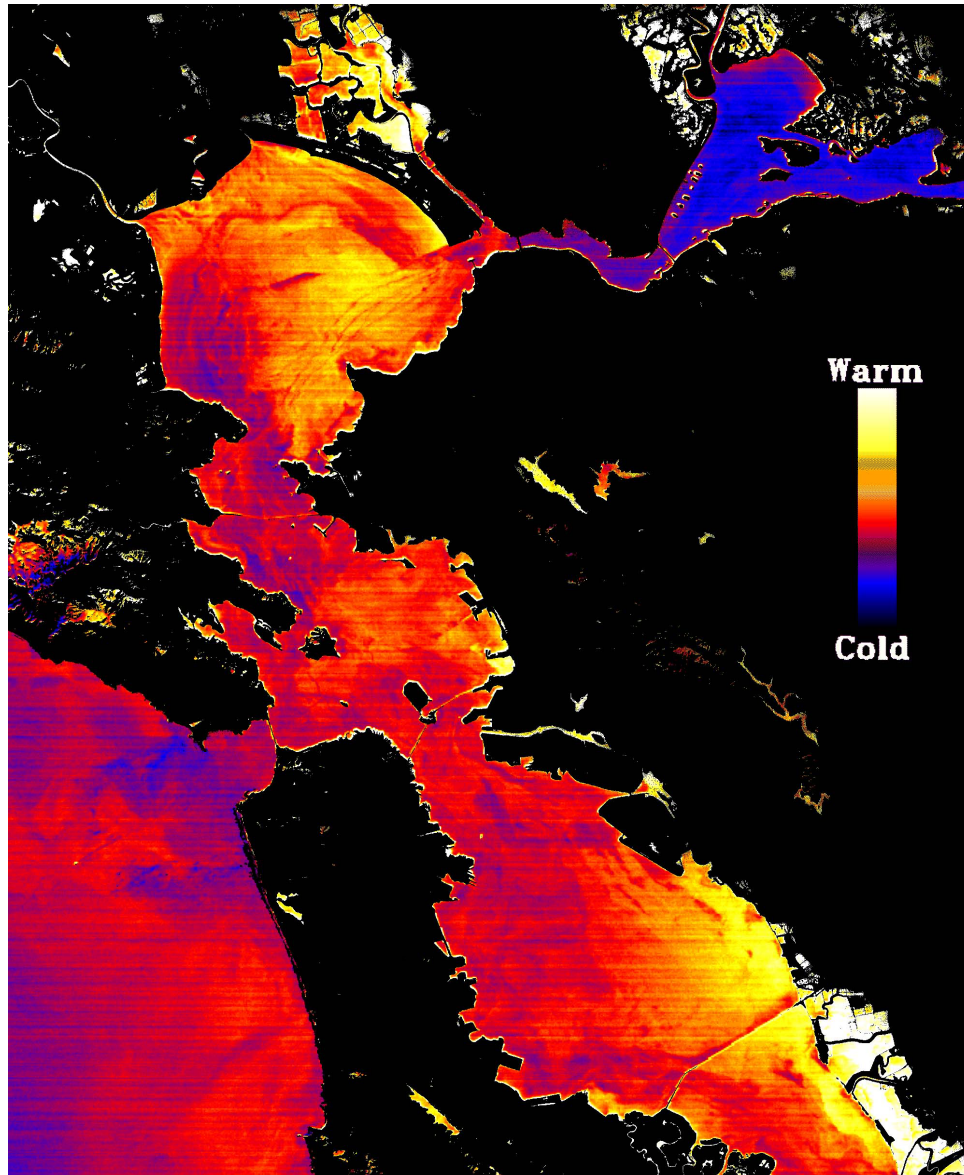
64. Bay waters here are warmer than river water. What corner of the image is the river inlet located? Circle your answer:

NW   NE   SW   SE

65. What direction is the river flowing?

From _____   to   _____

For each industry listed below, match it with the appropriate image by letter.

66. Hazard Planning = _____

67. Agriculture = _____

68. Urban/ Regional Planning = _____

IMAGE **A**

IMAGE **B**
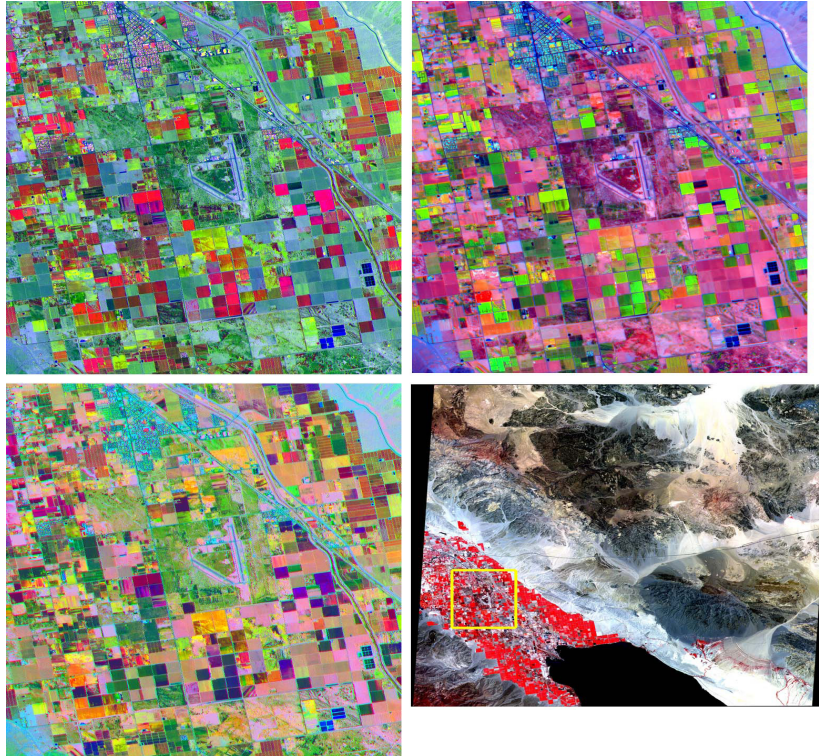

IMAGE **C**

*** End of **Remote Sensing Quiz** *** You did it! ☺ ***