Introduction to Remote Sensing Exercise

**Task:** In small groups, compare the true color and false color satellite images of the 2009 Alaska Railbelt Complex Fire area. These images date back several years before the fire occurred. Note that the black line represents the perimeter of the fire.

1. Examine a dark-green place on the true color image and identify the color of the corresponding place on the false-color image. Repeat this comparison in three different places.

2. Are there features (colors, shapes, lines or patterns) which stand out on the false color image that do not appear on the true color image? Circle three such features on your map with color markers.

3. On a separate piece of paper, describe the features that you identified and give names to them. Explain what you think that they may represent.

4. Create a legend for your map that includes the names and corresponding color markers of the features that you identified.

5. Compare the true color and false color images to the 2009 Alaska Railbelt Complex Pre-fire Vegetation Map. Is there a relationship that can be seen between the features on the vegetation map and the features on the true color image? On the false color image?

2009 Alaska Railbelt Complex Fire Area

True Color LANDSAT Satellite Image

False Color Satellite Image
Mapping Burn Severity

Part 1: Create a map of high severity burns of the 2009 Alaska Railbelt Complex Fire.

What you Need:
- Alaska Railbelt Complex Fire Burn Severity Image.
- Alaska Railbelt Complex Vegetation Map.
- Felt-tipped color markers or sharpees (black, red and green).
- A Pencil.

Mapping Steps:
1. Familiarize yourself with the features of the burn severity image:
   a. Find an example of each different legend item on your map.
2. Identify and mark high severity burn features with a pencil.
   a. Examine your map to find all areas where high severity burns occurred. Using a pencil, place a small X in the center of each high severity burn area. Place a small question mark (?) by any places that you are uncertain about.
3. Delineate and trace high severity burn area perimeters:
   a. Using a colored marker, trace the perimeter of each high severity burn area.
   b. Using a different colored marker, delineate and trace the perimeters of islands or pockets of moderate and light burn severity areas and unburned areas that fall within the perimeters of high severity burn areas.
4. Finish your map by making a legend with the features that you have mapped.

Part 2: Collecting and Analyzing Map Data

<table>
<thead>
<tr>
<th>High Severity Burn Vegetation Type</th>
<th>Predominant Vegetation Type</th>
<th>Total Square Count</th>
<th>Total Acreage</th>
<th>Percent of Total Burn Area</th>
<th>CO2 Emissions (Tons)</th>
<th>Equivalent # of Cars on Road/Yr</th>
<th>Equivalent # of Coal Burning Power Plants/Yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Severity Burn</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

1. Compare your new map with the pre-burn vegetation map. What vegetation type accounts for most of the high-severity burn area?

2. Calculate the acreage of high severity burns on your map. Each white square on the burn severity image is approximately 1,000 acres. Round up for squares that contain 50% or more area of high severity burns. The total area within the burn perimeter is 523,000 acres. (For perspective, one acre is about the size of a football field.) Fill in the table above.
3. Based upon results from a laboratory study, scientists found that every acre of black spruce feathermoss forest that is subject to high severity burns releases 100 tons of CO2 into the atmosphere. (Note that Black Spruce Feathermoss forest is the predominant forest type in the case study area.) What is the total contribution of CO2 to the atmosphere from this fire?

4. The average car in the United States emits 4 tons of carbon dioxide each year. In terms of CO2, how many cars on the road for a year was this fire equivalent to?

5. The average coal-fired power plant in the United States emits approximately 5 million tons of carbon dioxide per year. In terms of CO2, how many coal-fired power plants was this fire equivalent to?
Part 3. Forest Fires, Vegetation Change and the Carbon Cycle

1. What is the relationship between degree of burn severity and the amount of carbon dioxide, black carbon aerosols and charcoal produced?

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2. What is the relationship between vegetation type in the study area (forests and grasslands) and the amount of carbon dioxide, black carbon aerosols and charcoal produced?

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3. In a hypothetical scenario, several high severity burns repeated one after another in short succession within the 2009 Alaska Railbelt Complex fire burn perimeter. What would you expect to happen to the amount of biomass held in the forest trees and to the rate of cellular respiration in the forest trees and in the forest soil? Explain your reasoning. For each process on the diagram below, place an up or a down arrow to mark whether you expect an increase or a decrease.

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