



Monitoring Pre-fire Conditions: Lytton, Canada

In this exercise, we will analyze pre-wildfire conditions for multiple major wildfire outbreaks using web-based tools including: Climate Engine, Natural Resources Canada Maps and Reports, and the Global Wildfire Information System (GWIS). We will focus on our case-study example of the Lytton, BC, Canada wildfire outbreak in June and July of 2021.

Objectives:

- Analyze pre-fire climate and landscape conditions for the Lytton Fires of Canada from 2021 and the 2020 Bolivian fire outbreak

Overview of Topics:

- Introduction
- Part 1: Pre-fire Climatology in Climate Engine
- Part 2: Pre-fire Landscape Characteristics in Climate Engine
- Part 3: Fire Danger in Climate Engine
- Part 4: Natural Resources Canada Fire Mapping
- Part 5: The Global Wildfire Information System (GWIS)
- Conclusion

Tools needed:

- Chrome web browser

Introduction

In this exercise, we will explore the climatic and landscape conditions near Lytton, BC, Canada prior to the Lytton, BC, Canada wildfire outbreak.

On June 30th, 2021 a large fire broke out near Lytton, BC, Canada after three consecutive days of record-breaking heat. The day before the fire began, temperatures reached 49.5° C (121° F), the hottest ever recorded in the country. This streak of temperatures came as part of a record-breaking heat wave, which impacted much of the western U.S. and southwestern Canada.

Lytton First Nation is located at the confluence of the Fraser and Thompson rivers in the traditional territory of the Indigenous Nlaka'pamux people. Lytton First Nation is a member of the Nlaka'pamux Nation Tribal Council, along with Snepa, Nteq'em,

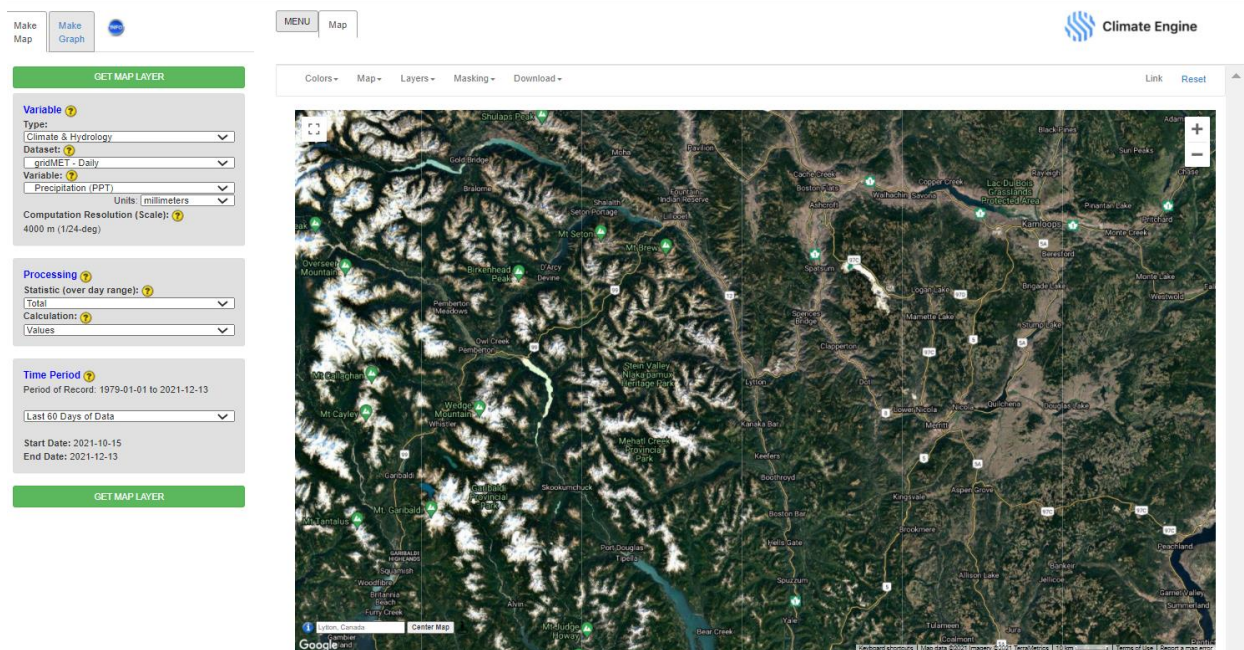
Skuppah and Boothroyd member communities. The village of Lytton was devastated by the fire, as well as many surrounding reserves.

Part 1: Pre-fire Climatology

1. Open Google Chrome
2. Navigate to the website: <https://climateengine.com/>
3. Along the top, click on **Research App**
4. Scroll down the webpage and click on **Go to App**

When you first arrive on the Climate Engine App website you will be given the option to take a tour. This is recommended if you have never used the interface. For now, we will skip the tour and get directly to our analysis.

5. In the bottom of the map, where it says **Enter Place or Location**, type: **Lytton, Canada** and click on **Center Map**.

The image shows a screenshot of the Climate Engine web application. On the left side, there is a 'GET MAP LAYER' panel with several configuration options: 'Variable' set to 'Precipitation (PPT)', 'Type' set to 'Climate & Hydrology', 'Dataset' set to 'gndMET - Daily', 'Units' set to 'millimeters', and 'Computation Resolution (Scale)' set to '4000 m (1/24-deg)'. Below this, the 'Processing' section is set to 'Statistic (over day range)' with 'Total' selected. The 'Time Period' section shows a 'Period of Record' from 1979-01-01 to 2021-12-13 and 'Last 60 Days of Data' selected. At the bottom of the panel, 'Start Date' is 2021-10-15 and 'End Date' is 2021-12-13. The main map area displays a satellite-style topographic map of the Lytton, Canada region, with various towns and geographical features labeled. The 'Climate Engine' logo is visible in the top right corner of the interface.

This will direct you to the region surrounding Lytton, Canada.

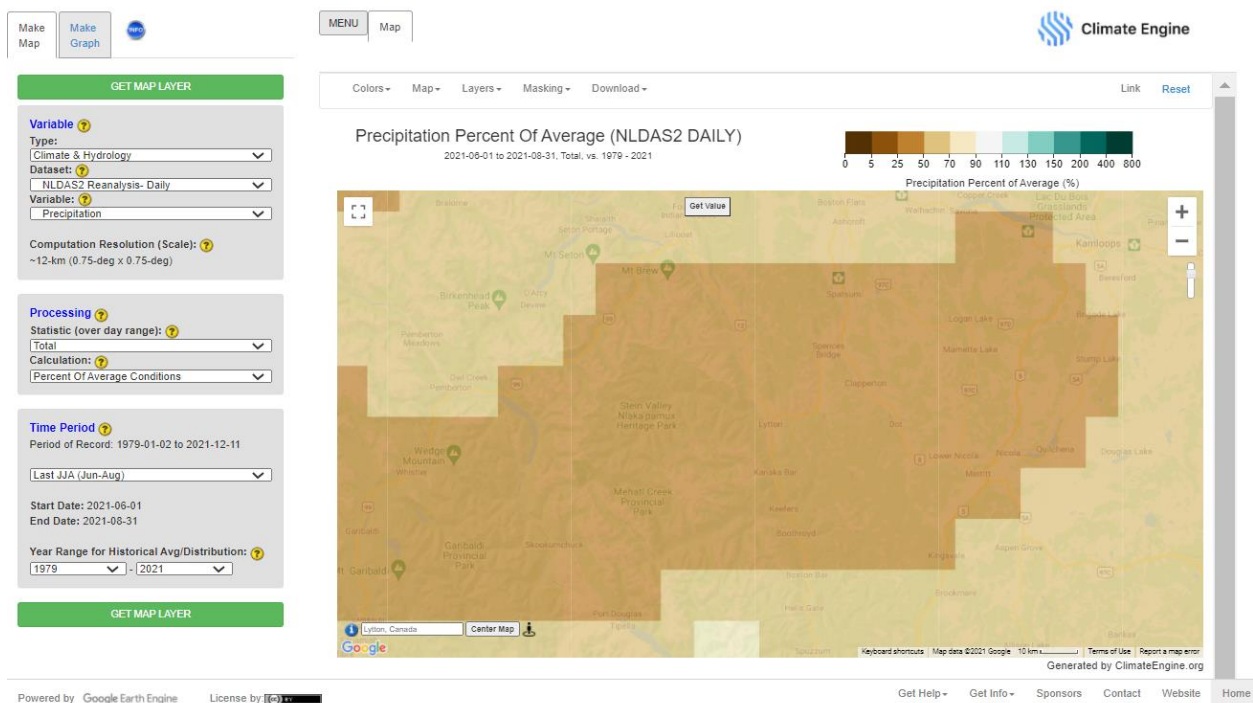
6. Along the top, click on **Map**, then under **Base Map**, select **Road Map**. Now you should see the town of Lytton, CA clearly.

Precipitation and Drought

7. Along the left-hand side, use the **Make Map** panel to select your visualization options.
 - a. Keep the **Variable Type** as **Climate and Hydrology**

- b. Change the **Dataset** to **NLDAS2 Reanalysis - Daily**
- c. Under **Variable** select **Precipitation**
- d. Under **Processing**, keep the **Statistic (over day range)** as **Total** and change the **Calculation** to **Percent of Average Conditions**
- e. Under **Time Period**, change the date to **Last JJA (Jun-Aug)**
- f. Click on **Get Map Layer** along the bottom and wait for the map to load

During this step, and for many of the steps in this exercise, there is a large computational lift, and therefore it can take a few minutes for your map to load. Please be patient. If the map does not load you can always use the Reset button along the top and repeat the steps above. Additionally, if many users on conducting analysis on Climate Engine, the time for maps to load can be delayed.




8. Along the top of the map, click on **Get Value**. This will center a geomarker on Lytton, CA. Click on **Show Value** and wait for the data to load.
 - a. Here you can see that the precipitation was nearly 40% of average for this region in the summer months around the fire period.
 - b. **Optional Step**: Change the date range to **Last MAM (Mar-May)** and see how your map compares.
 - c. **Optional Step**: Change the date range to **Last Northern Water Year** and see how your map compares.

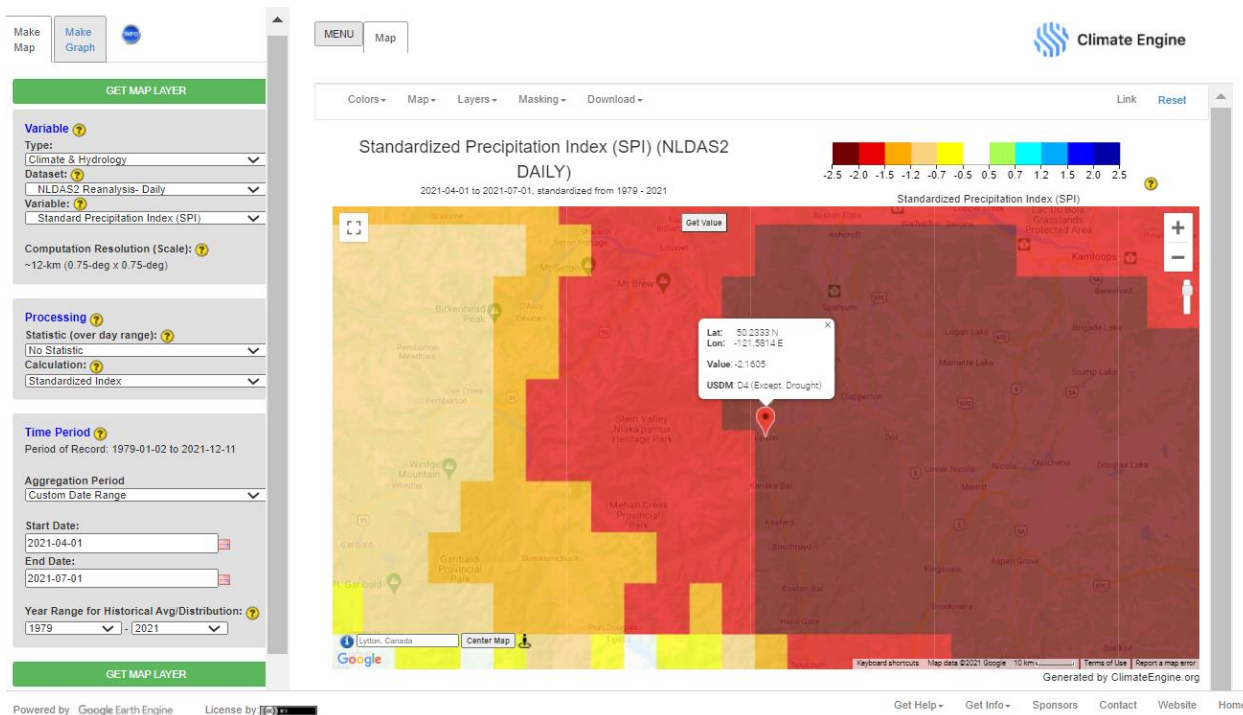
We can also compare various drought indices that are a reflection of the precipitation (and other climate variables like evapotranspiration) anomalies.

NASA ARSET Using Earth Observations for Pre- and Post-wildfire Monitoring
Exercise 1: Pre-fire Conditions of the Lytton, Canada Fires

9. Along the **Make Map** panel, change the **Variable** to the Standardized Precipitation Index (SPI)
10. Under **Time Period**, select **Custom Date Range**
 - a. Start Date: 2021-04-01
 - b. End Date: 2021-07-01

This will generate a map of the 3-month SPI leading up to the fire outbreak.

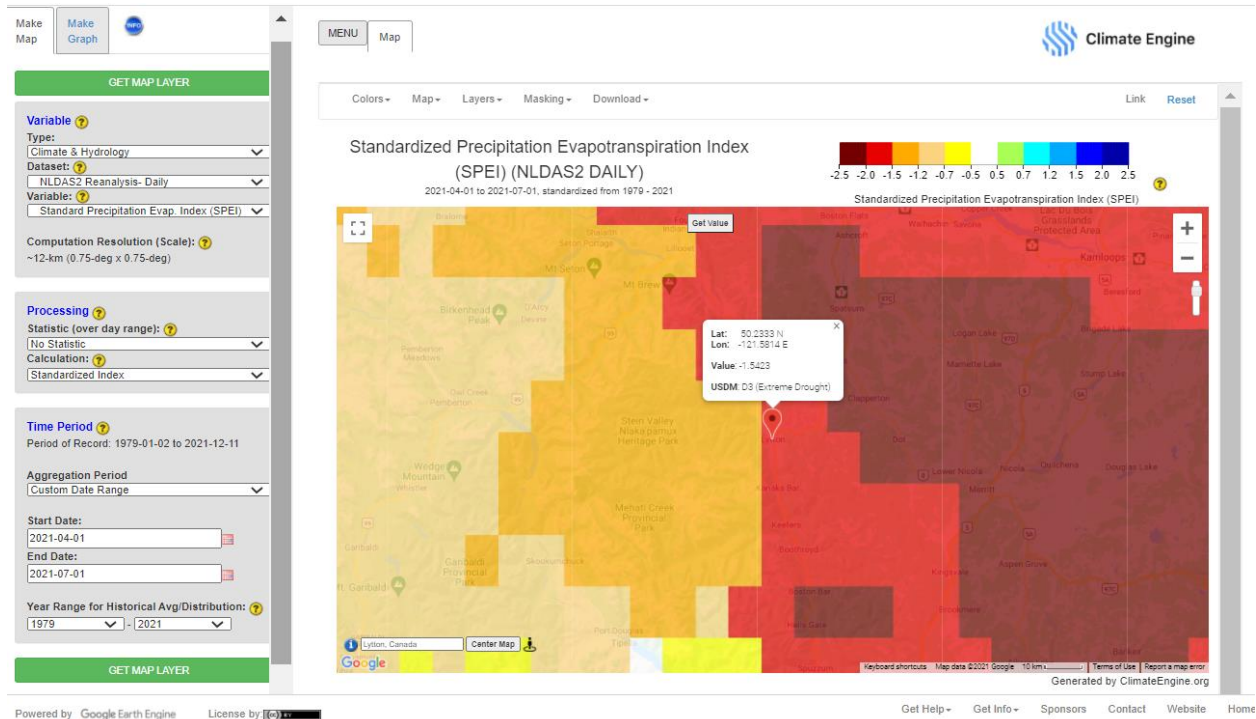
11. Click on **Get Map Layer** and wait for the map to load
12. Click on **Get Value** and center a geomarker on Lytton, CA. Click on **Show Value** and wait for the data to load.
 - a. Here you can see that the 3-month SPI value is -2.2, which is an Exceptional Drought according to the US Drought Monitor.
13. Click on the yellow question mark icon  next to **Variable** on the **Make Map** panel.
 - a. Here you can learn more about each variable with links to references. Read about how the SPI is calculated. Click on the **X** in the top right of the pop-up to close the window.



14. Along the **Make Map** panel, change the **Variable** to the **Standardized Precipitation Evap. Index (SPEI)**
15. Keep all other settings the same as the previous steps. Click on **Get Map Layer** and wait for the map to load.

NASA ARSET Using Earth Observations for Pre- and Post-wildfire Monitoring
Exercise 1: Pre-fire Conditions of the Lytton, Canada Fires

- a. Notice that the drought designation for the SPEI is lower than the SPI with the inclusion of evapotranspiration anomalies. However, the region is still in the D3: Extreme Drought category.



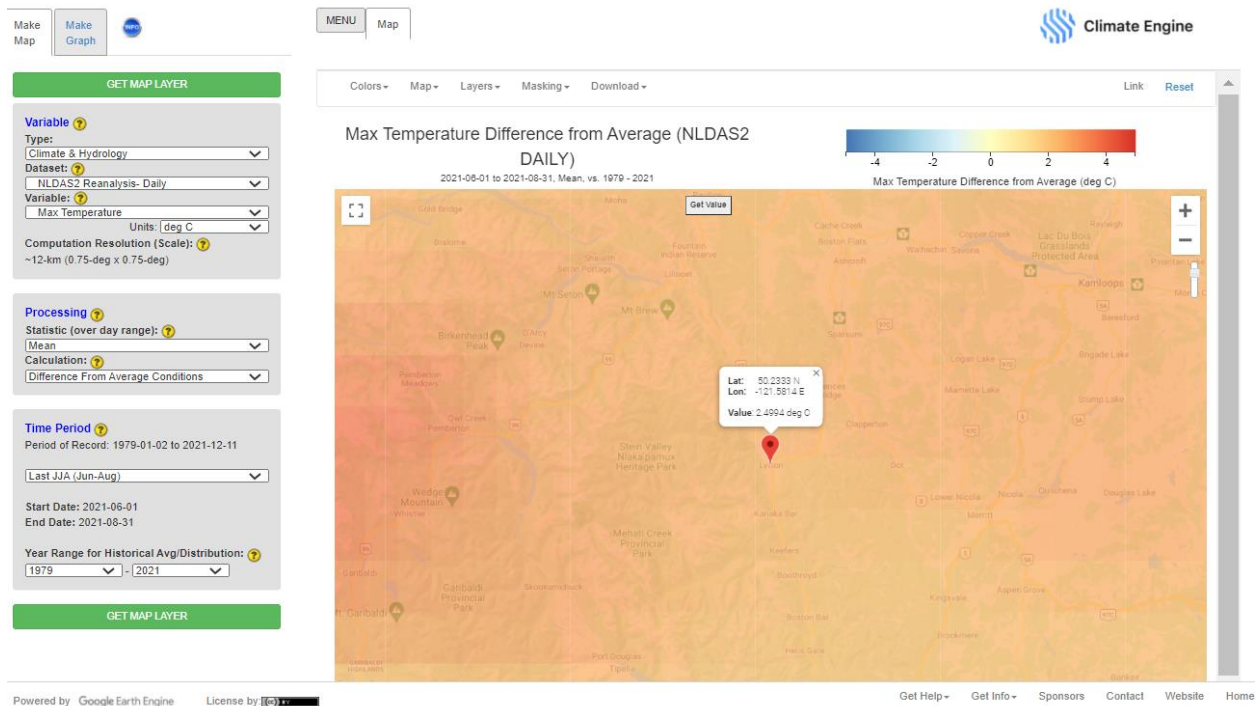
Note that if the data have loaded on your map, and the **Processing Request** window is still up, you can click on **Cancel Request** to view and interact with the data.

You can also take a look at the values from the North American Drought Monitor, which is a cooperative effort between Canada, Mexico, and the United States.

16. Along the **Make Map** panel, change the **Dataset** to the **North American Drought Monitor**
17. The **Variable** should be automatically updated to **Drought Classification**
18. Ensure the **Statistic (over day range)** is the **Mean** and the **Calculation** is **Values**
19. Keep the **Time Period** as **Last JJA (Jun-Aug) in Data**
20. Click on **Get Map Layer** and wait for the map to load
21. Click on **Get Value** and center a geomarker on Lytton, CA. Click on **Show Value** and wait for the data to load.
 - a. Here you can see that the Drought Classification value is 2.3, which is Severe Drought.

Temperature

22. Click on **Reset** along the top right of the webpage.
23. Under **Enter Place or Location**, type: **Lytton, Canada** and click on **Center Map**.
24. Under **Map** along the top, change the **Base Map** to **Road Map**
25. Along the left-hand side, use the **Make Map** panel to select your visualization options.
 - b. Keep the **Variable Type** as **Climate and Hydrology**
 - c. Change the **Dataset** to **NLDAS2 Reanalysis - Daily**
 - d. Under **Variable** select **Max Temperature**
 - e. Under **Processing**, keep the **Statistic (over day range)** as **Mean** and change the **Calculation** to **Difference From Average Conditions**
 - f. Under **Time Period**, change the date to **Last JJA (Jun-Aug)**
 - g. Click on **Get Map Layer** along the bottom and wait for the map to load
26. Click on **Get Value** and center a geomarker on Lytton, CA. Click on **Show Value** and wait for the data to load.
 - h. Here you can see that the maximum temperature difference from average was 2.5 degrees Celsius hotter than normal



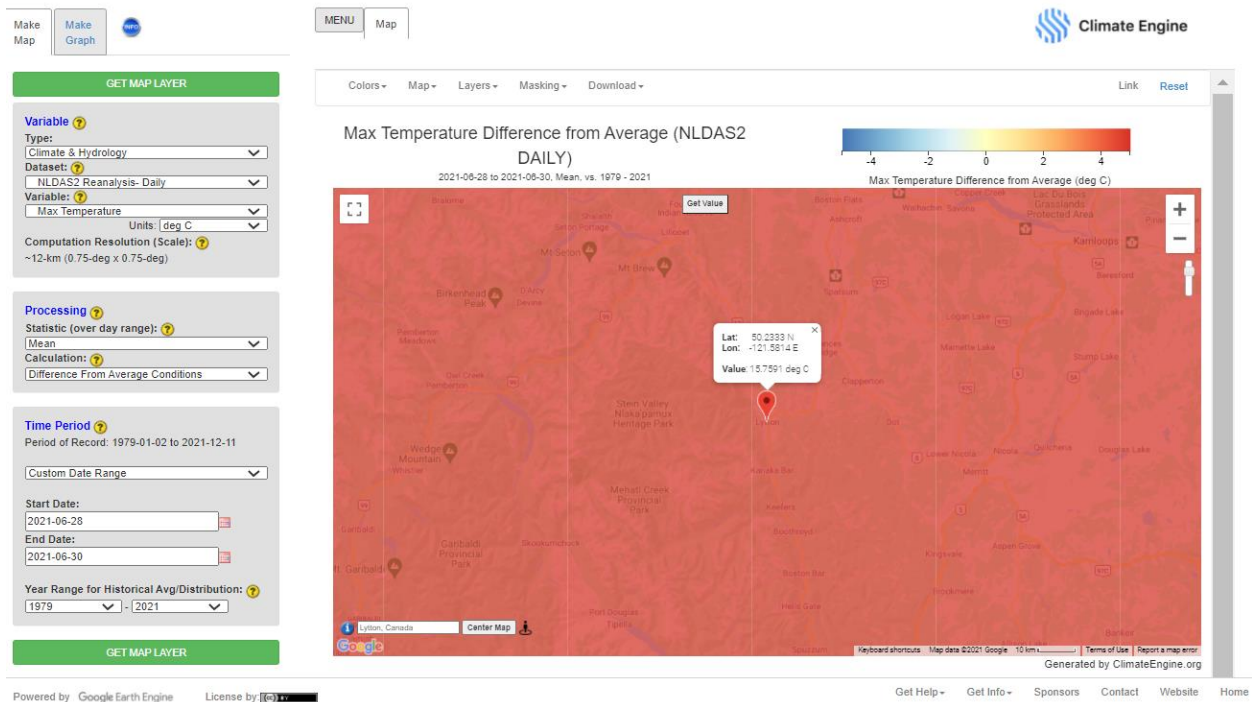
27. **Optional Steps:** Check out the temperature anomalies from the last JJA for two other models: the **CFS Reanalysis** and/or **MERRA-2**.

Let's also take a look at the temperature anomalies in the days preceding the fire, as this was a prominent factor in the outbreak and spread.

28. Under **Time Period**, change the date to **Custom Date Range**

NASA ARSET Using Earth Observations for Pre- and Post-wildfire Monitoring
Exercise 1: Pre-fire Conditions of the Lytton, Canada Fires

- a. **Start Date: 2021-06-28**
 - b. **End Date: 2021-06-30**
 - c. Click on **Get Map Layer** along the bottom and wait for the map to load
29. Click on **Get Value** and center a geomarker on Lytton, CA. Click on **Show Value** and wait for the data to load.
- a. Here you can see that the maximum temperature difference from average was 15.8 degrees Celsius hotter than normal!

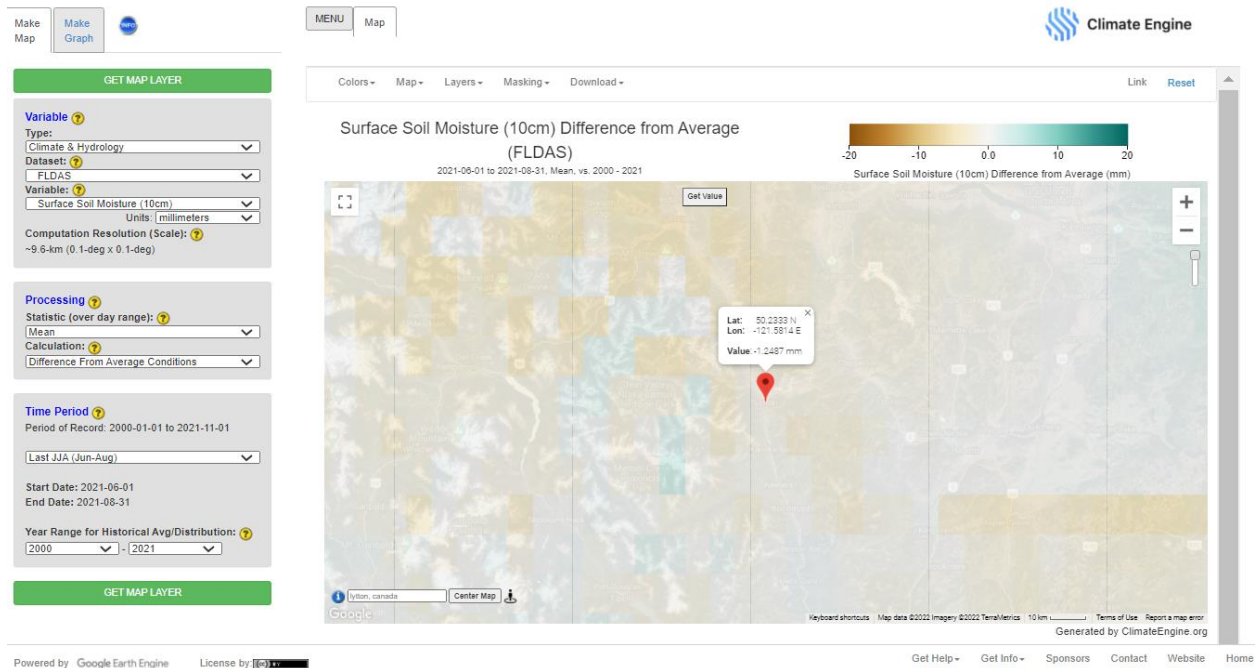


30. **Optional Step:** Zoom out using the minus sign on the right side of the map and take a look at the heat dome affecting much of the western and northeastern US and Canada.

Soil Moisture

31. Ensure your map is centered on Lytton, CA
32. Along the left-hand side, use the **Make Map** panel to select your visualization options.
 - a. Keep the **Variable Type** as **Climate and Hydrology**
 - b. Change the **Dataset** to **FLDAS**
 - c. Under **Variable** select **Surface Soil Moisture**
 - d. Under **Processing**, keep the **Statistic (over day range)** as **Mean** and the **Calculation** to **Difference From Average Conditions**
 - e. Under **Time Period**, change the date to **Last JJA (Jun-Aug)**
33. Click on **Get Map Layer** along the bottom and wait for the map to load
34. Click on **Get Value** and center a geomarker on Lytton, CA. Click on **Show Value** and wait for the data to load.

35. **Optional Step:** Take a look at some of the other climate model products under **Datasets** to see if there are other soil moisture metrics to analyze. Run the analysis for the same time period or test out the MAM time period.

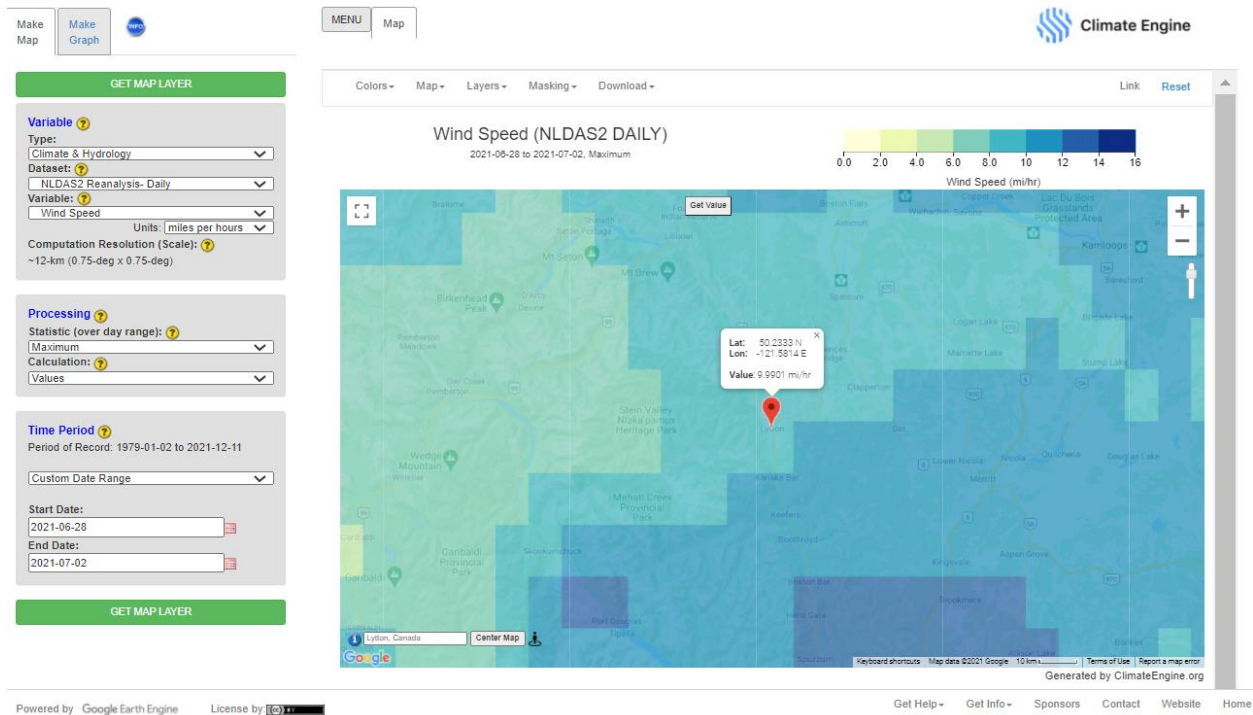


Wind Speed

1. Ensure your map is centered on Lytton, CA
2. Along the left-hand side, use the **Make Map** panel to select your visualization options.
 - a. Keep the **Variable Type** as **Climate and Hydrology**
 - b. Change the **Dataset** to **NLDAS2Reanalysis-Daily**
 - c. Under **Variable** select **Wind Speed**
 - d. Under **Units** select **miles per hour**
 - e. Under **Processing**, change the **Statistic (over day range)** to **Maximum** and the **Calculation** to **Values**
3. Under **Time Period**, change the date to **Custom Date Range**
 - a. **Start Date: 2021-06-28**
 - b. **End Date: 2021-07-02**
4. Click on **Get Map Layer** along the bottom and wait for the map to load
5. Click on **Get Value** and center a geomarker on Lytton, CA. Click on **Show Value** and wait for the data to load.
 - a. Here you can see that the maximum wind speeds were estimated to be about 10 mph. However, some ground stations measured wind speeds of nearly 45 mph, especially in the high elevation regions.

NASA ARSET Using Earth Observations for Pre- and Post-wildfire Monitoring

Exercise 1: Pre-fire Conditions of the Lytton, Canada Fires



Part 2: Pre-fire Landscape Characteristics

Topography

1. Click on **Reset** along the top right of the webpage.
2. Under **Enter Place or Location**, type: **Lytton, Canada** and click on **Center Map**.
3. Under **Map** along the top, change the **Base Map** to **Terrain**
4. Use the plus sign on the right side of the map to zoom far into the town of Lytton, BC, Canada
 - i. You can see that this is complex, mountainous terrain. Much of these data comes from the Shuttle Radar Topography Mission (SRTM).

While in the terrain view, if you zoom in close enough you can see the contour lines indicating changes in elevation. You can also see the ridgelines, canyons, and regions that are covered in vegetation or barer.

5. Click on the closest peak west of Lytton called Mount Roach
6. Click on the View in Google Maps option that pops-up.

NASA ARSET Using Earth Observations for Pre- and Post-wildfire Monitoring

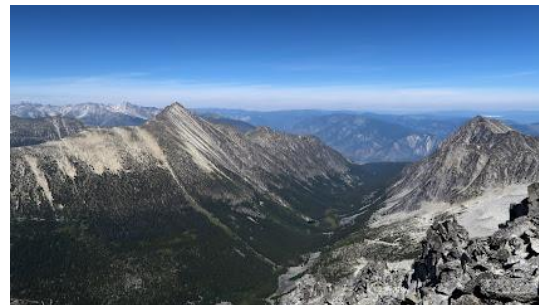
Exercise 1: Pre-fire Conditions of the Lytton, Canada Fires

The screenshot displays the Climate Engine web application. On the left, the 'Make Map' panel is active, showing the following settings:

- Variable:** Type: Climate & Hydrology; Dataset: gridMET - Daily; Variable: Precipitation (PPT); Units: millimeters; Computation Resolution (Scale): 4000 m (1/24-deg).
- Processing:** Statistic (over day range): Total; Calculation: Values.
- Time Period:** Period of Record: 1979-01-01 to 2021-12-14; Last 60 Days of Data.

The main map area shows a topographic view of the Lytton region in British Columbia, Canada. A tooltip for Mount Roach is displayed, indicating its elevation as 2206 meters (7415 feet) and its location in British Columbia V0K 1Z0, Canada. The map includes navigation controls and a 'Get Map Layer' button at the bottom.

In Google Maps you can then click on Mount Roach to obtain more information, including pictures and the elevation (2206 meters or 7415 feet). This provides insight to the topography of the region. As mentioned in the lecture, topography affects the spread of fires. In particular, as the slope increases fire spreads faster. Additionally, the aspect can affect the solar radiation, which in turn affects the solar radiation and fire spread.



Vegetation Health

7. Ensure your map is centered on Lytton, CA
8. Along the left-hand side, use the **Make Map** panel to select your visualization options.
 - a. Change the **Variable Type** to **Remote Sensing**
 - b. Change the **Dataset** to **Sentinel 2 Surface Reflectance**
 - c. Ensure the **Variable** is **NDVI (Vegetation Index)**
 - d. Under **Processing**, ensure the **Statistic (over day range)** is **Mean**
 - e. Ensure the **Calculation** is **Values**
9. Under **Time Period**, select **Last Northern Water Year**
10. Click on **Get Map Layer** along the bottom and wait for the map to load.

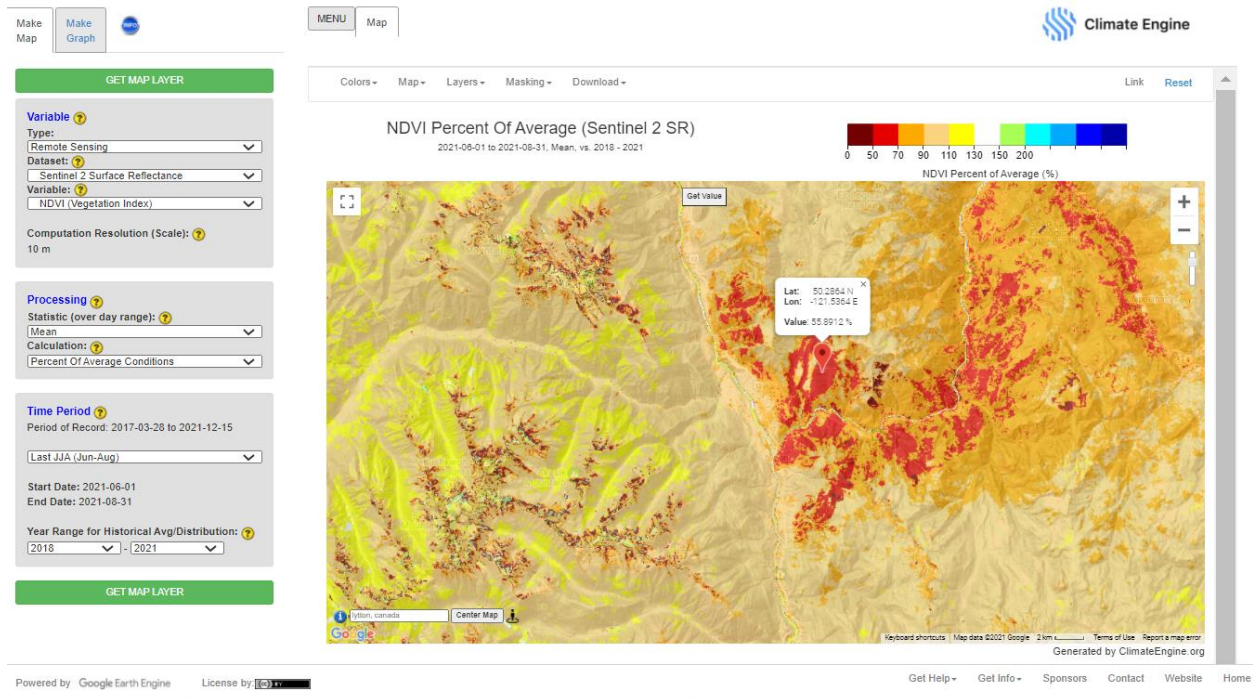
Here you can see that much of the region has dense vegetation, especially in the lower elevations regions and along the waterways, and with less dense vegetation near the mountain peaks. Now let's take a look at how healthy the vegetation is in this region in the months prior to the fires and during the fires.

11. Ensure your map is centered on Lytton, CA
12. Along the left-hand side, use the **Make Map** panel to select your visualization options.
 - f. Change the **Variable Type** to **Remote Sensing**
 - g. Change the **Dataset** to **Sentinel 2 Surface Reflectance**
 - h. Ensure the **Variable** is **NDVI (Vegetation Index)**
 - i. Under **Processing**, ensure the **Statistic (over day range)** is **Mean**
 - j. Change the **Calculation** to **Percent of Average Conditions**
13. Under **Time Period**, select **Last MAM (Mar-May)**
14. Click on **Get Map Layer** along the bottom and wait for the map to load

In the months preceding the wildfire outbreak, much of the region has relatively normal NDVI values. Now let's take a look at the June to August NDVI percent of average conditions.

15. Leave all previous options as stated and Under **Time Period**, select **Last JJA (Jun-Aug)**
16. Click on **Get Map Layer** along the bottom and wait for the map to load
17. Click on **Get Value** and center a geomarker on Lytton, CA. Click on **Show Value** and wait for the data to load.
 - a. While the NDVI percent of average conditions in Lytton are just over 92%, much of the regions to the east of the town display lower than average NDVI, indicating less than average vegetation vigor, or drier vegetation conditions. Move around the geomarker to various places on the map to investigate these differences.

NASA ARSET Using Earth Observations for Pre- and Post-wildfire Monitoring
Exercise 1: Pre-fire Conditions of the Lytton, Canada Fires



Now let's take a look at the NDWI to identify variations in the moisture content of the vegetation. First, we will view the typical NDWI values in the region, then we will examine the difference from average.

18. In the **Make Map** panel change the **Variable** to **NDWI (NIR/SWIR1)**
 - k. Under **Processing**, ensure the **Statistic (over day range)** is **Mean**
 - l. Change the **Calculation** to **Values**
19. Under **Time Period**, select the **Entire Period of Record of Dataset**
20. Click on **Get Map Layer** along the bottom and wait for the map to load

Here you can see that the NDWI values range from about -0.1 to 0.6, and vary based on the elevation and aspect. Now let's see how the time period during the fires deviated from those average vegetation moisture conditions.

NASA ARSET Using Earth Observations for Pre- and Post-wildfire Monitoring
Exercise 1: Pre-fire Conditions of the Lytton, Canada Fires

The screenshot shows the Climate Engine interface. On the left is the 'Make Map' panel with the following settings:

- Variable:** Type: Remote Sensing; Dataset: Sentinel 2 Surface Reflectance; Variable: NDWI (NIR/SWIR1); Computation Resolution (Scale): 10 m.
- Processing:** Statistic (over day range): Mean; Calculation: Values.
- Time Period:** Period of Record: 2017-03-28 to 2021-12-30; Entire Period of Record of Dataset; Start Date: 2017-03-28; End Date: 2021-12-30.

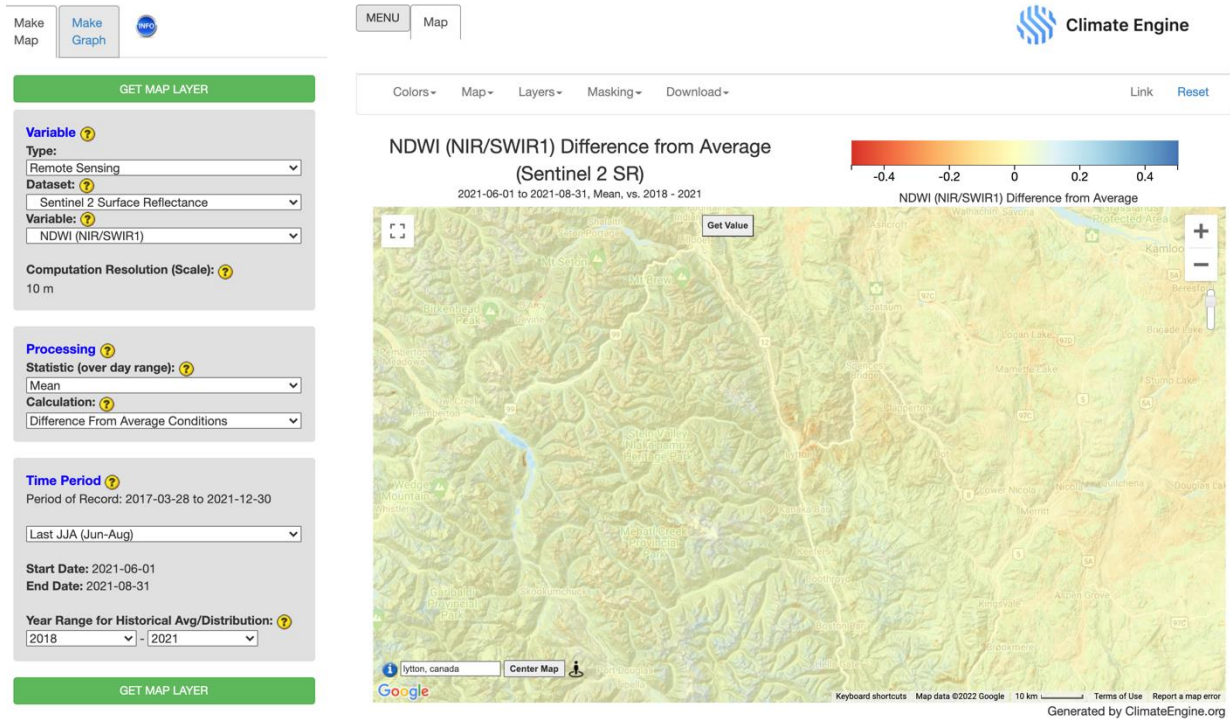
The map displays 'NDWI (NIR/SWIR1) (Sentinel 2 SR)' for the period '2017-03-28 to 2021-12-30, Mean'. A color scale ranges from -0.2 (dark blue) to 0.6 (light blue). The map shows a blue-toned landscape with a river and surrounding terrain. The map is centered on Lytton, Canada. The interface includes a 'MENU' button, 'Map' button, and 'Climate Engine' logo. There are also 'Colors', 'Map', 'Layers', 'Masking', and 'Download' options, along with 'Link' and 'Reset' buttons. The map includes a 'Get Value' button and a 'Center Map' button. The map data is attributed to Google, and the interface is generated by ClimateEngine.org.

21. In the **Make Map** panel change the **Calculation** to **Difference From Average Conditions**
22. Under **Time Period**, select the **Last JJA (Jun-Aug)**
23. Click on **Get Map Layer** along the bottom and wait for the map to load

Here you can see that much of the same regions that experienced lower than normal NDVI values also experienced lower than normal NDWI values. Indicating that the vegetation in the region is dry and prone to fire outbreak and higher rates of spread.

NASA ARSET Using Earth Observations for Pre- and Post-wildfire Monitoring

Exercise 1: Pre-fire Conditions of the Lytton, Canada Fires



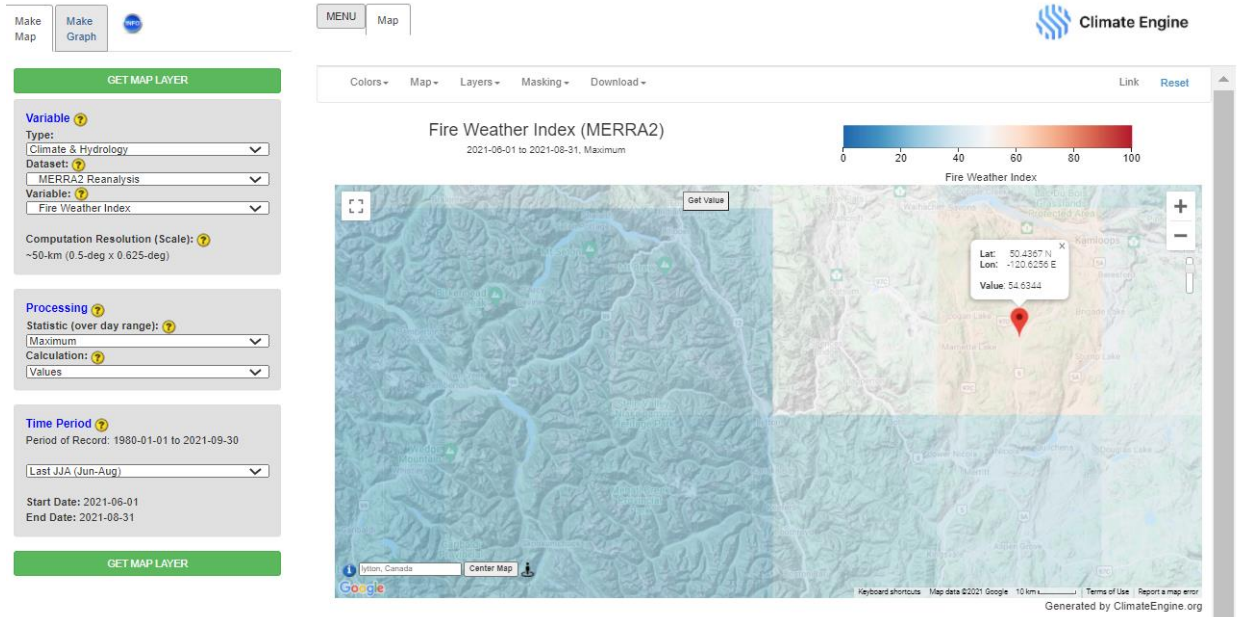
Part 3: Fire Danger

The Fire Weather Index is a component of the Canadian Forest Fire Weather Index (FWI) System. It is a numeric rating of fire intensity. It is based on the ISI and the BUI, and is used as a general index of fire danger throughout the forested areas of Canada. It describes the likelihood that a fire could start or spread, based on recent weather conditions.

1. Click on **Reset** along the top right of the webpage.
2. Under **Enter Place or Location**, type: **Lytton, Canada** and click on **Center Map**.
3. Under **Map** along the top, change the **Base Map** to **Terrain**
4. Along the left-hand side, use the **Make Map** panel to select your visualization options.
 - a. Ensure the **Variable Type** is **Climate & Hydrology**
 - b. Change the **Dataset** to **MERRA2 Reanalysis**
 - c. Change the **Variable** to **Fire Weather Index**
 - d. Under **Processing**, change the **Statistic (over day range)** to **Maximum** and the **Calculation** to **Values**
5. Under **Time Period**, select **Last JJA (Jun-Aug)**
6. Click on **Get Map Layer** along the bottom and wait for the map to load
7. Use the **Get Value** feature to click on the map somewhere near Lytton to reveal the FWI value.

Here you can see the FWI ranges from about 20-60 across the region.

NASA ARSET Using Earth Observations for Pre- and Post-wildfire Monitoring
Exercise 1: Pre-fire Conditions of the Lytton, Canada Fires



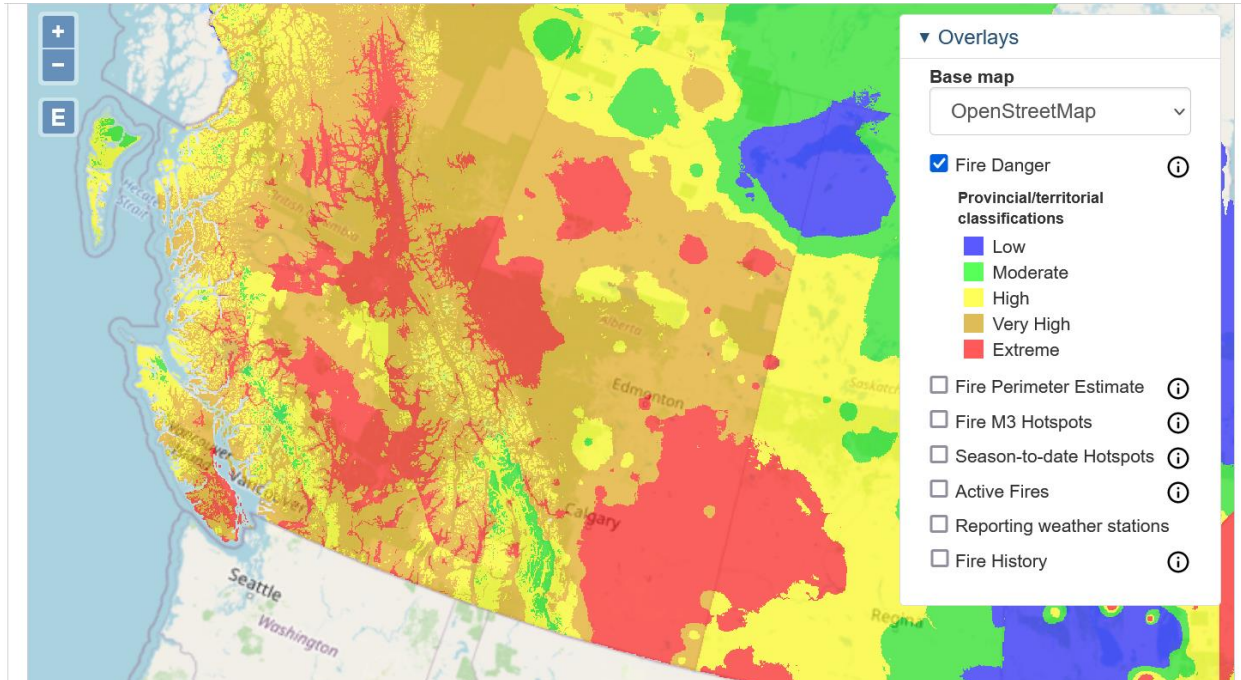
36. **Optional Step:** Change the dates using the **Custom Date Range** option to the few days around the wildfire outbreak. Does the FWI change dramatically across the region?

Part 4: Natural Resources Canada Fire Mapping

Some countries have their own data repository for monitoring pre-fire conditions and for post-fire mapping. In this example, Natural Resources Canada provides background information and interactive maps to conduct these assessments. In this section of the exercise, we will explore Natural Resources Canada's Forest Fire Weather Information (FWI) System Interactive Map.

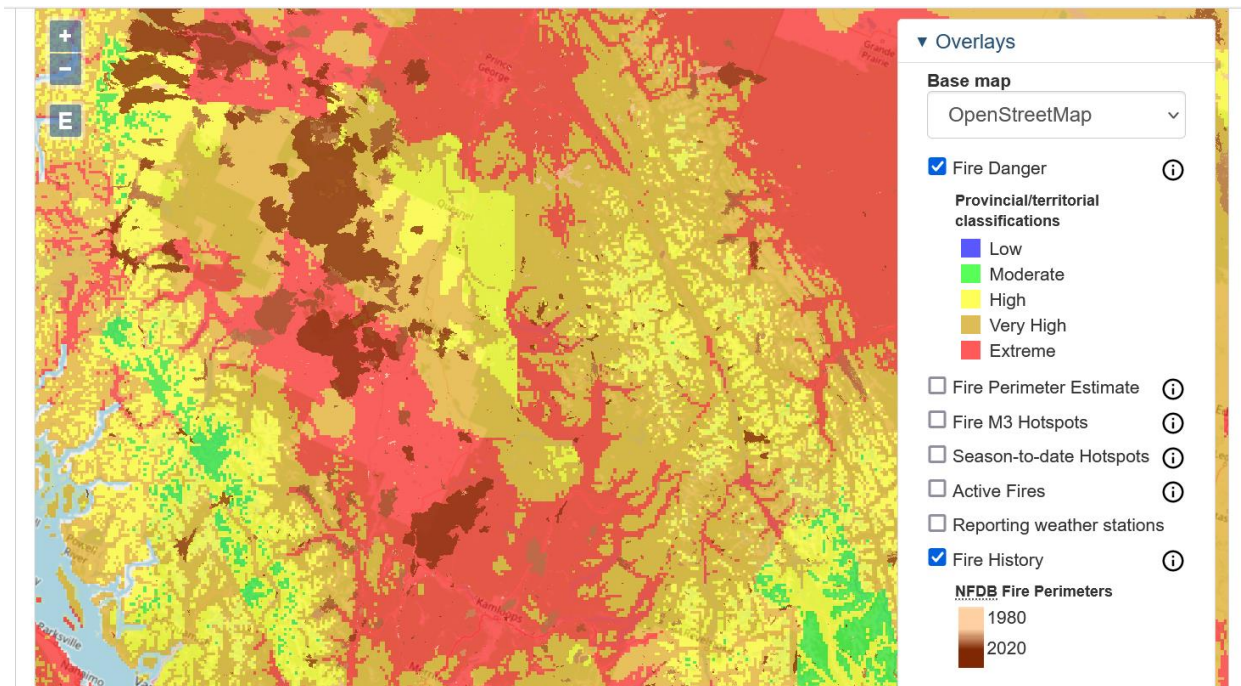
1. Open Google Chrome
2. Navigate to the Natural Resources Canada website:
<https://cwfis.cfs.nrcan.gc.ca/background/summary/fwi>
 - a. Read through the information about how the FWI is calculated.
3. Along the left side click on **Interactive Map**
4. Along the top of the **Interactive Map**, change the date to **June 28, 2021** (two days before the Lytton Fire started) and click on **Retrieve Map**
5. Along the top right, click on **Overlays** to expand the map options.
6. Initially, you can see the **Fire Danger** layer turned on
7. Zoom into British Columbia and take a closer look at the fire danger conditions in our study area

NASA ARSET Using Earth Observations for Pre- and Post-wildfire Monitoring
Exercise 1: Pre-fire Conditions of the Lytton, Canada Fires



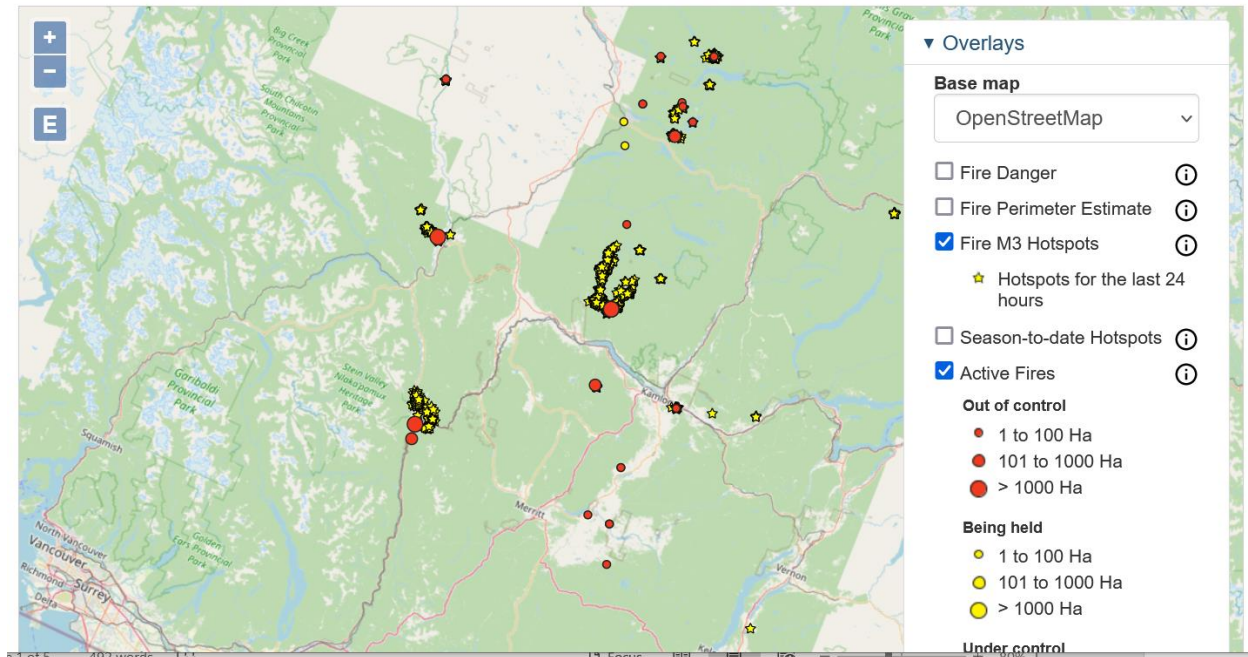
Here you can see that the Fire Danger in much of this region is High to Extreme, which aligns with the previous data we have examined.

8. Turn on the **Fire History** layer and see how it compares with the regions that are under a high Fire Danger.



While we are not focused the active fire mapping for this training, the NRC website also has an Active Fires Layer and Season to Date hot spots.

9. Change the date to **July 2, 2021** and click on **Retrieve Map**
10. Turn off the **Fire Danger** and **Fire History** layers
11. Turn on the **Fire 3M Hotspots** and the **Active Fires** layers
12. Zoom into the region near Lytton, CA and take a look at the active fires in the region



The NRC website also provides seasonal fire forecast maps, the National Wildland Fire Situation Report, a historical analysis of fire danger climatology and fire history for Canada, and a whole suite of data via their Canadian Wildland Fire Information System Datamart webpage.

13. Along the top of the webpage click on **Fire**
14. Read through the background information provided and scroll to the bottom of the webpage under the **Find out more** heading. Feel free to explore these different topics.
15. Click on the **Canadian Wildland Fire Information System (CWIFIS)** link
 - a. Here you can view the most recent Fire Weather, Fire Behavior, and Fire M3 Hotspots maps.

The **Canadian Wildland Fire Information System (CWFIS)** creates daily fire weather and fire behavior maps year-round and hot spot maps throughout the forest fire season, generally between May and September.

Fire Weather

[View the most recent Fire Danger map](#)

Fire Behavior

[View the most recent Head Fire Intensity](#)

Fire M3 Hotspots

[View the most recent Daily Hotspot map](#)

16. Scroll down and click on **CWFIS Datamart**

17. Take a look at all the various data sources available such as burned area composites, fire polygon data, smoke plumes, and more.

- a. Which of these datasets are most valuable to you? What are the most useful data formats for your work? Are there similar data repositories for your country or study region?

Part 5: The Global Wildfire Information System (GWIS)

In the final portion of this exercise, we will explore the Global Wildfire Information System (GWIS) and use our Lytton, Canada fire as an example.

1. Navigate to the GWIS website: <https://gwis.irc.ec.europa.eu/>
 - a. Read about the program and global work
2. Scroll to the bottom of the webpage and click on **Long-term fire weather forecast**
3. Along the left side, click on North America
 - a. Take a look at the monthly and seasonal maps of temperature and rainfall anomalies.

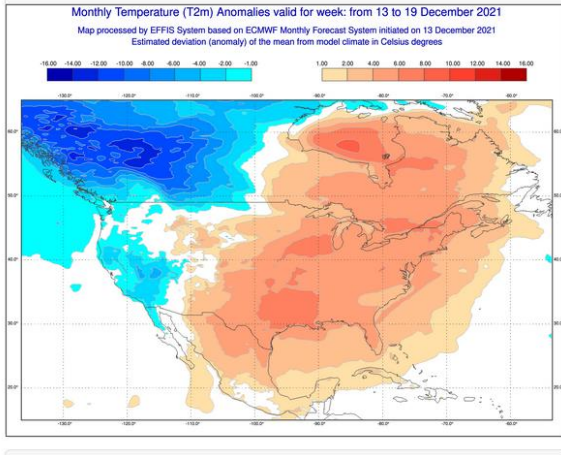
Long-term Monthly forecast of temperature and rainfall anomalies

Monthly forecast

Seasonal forecast

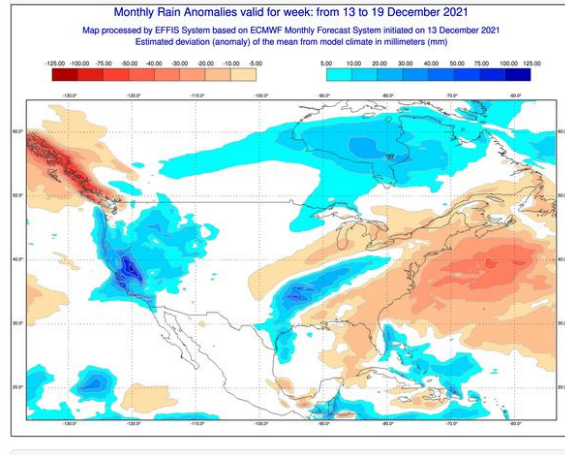
Temperature anomalies

Week 1 starting from: Monday 13/12/2021



Rain anomalies

Week 1 starting from: Monday 13/12/2021

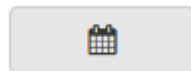


We can also look retrospectively at various fire danger data layers using the Current Situation Viewer.

4. Along the top of the webpage, click on **Apps**
5. Click on **Current Situation Viewer**

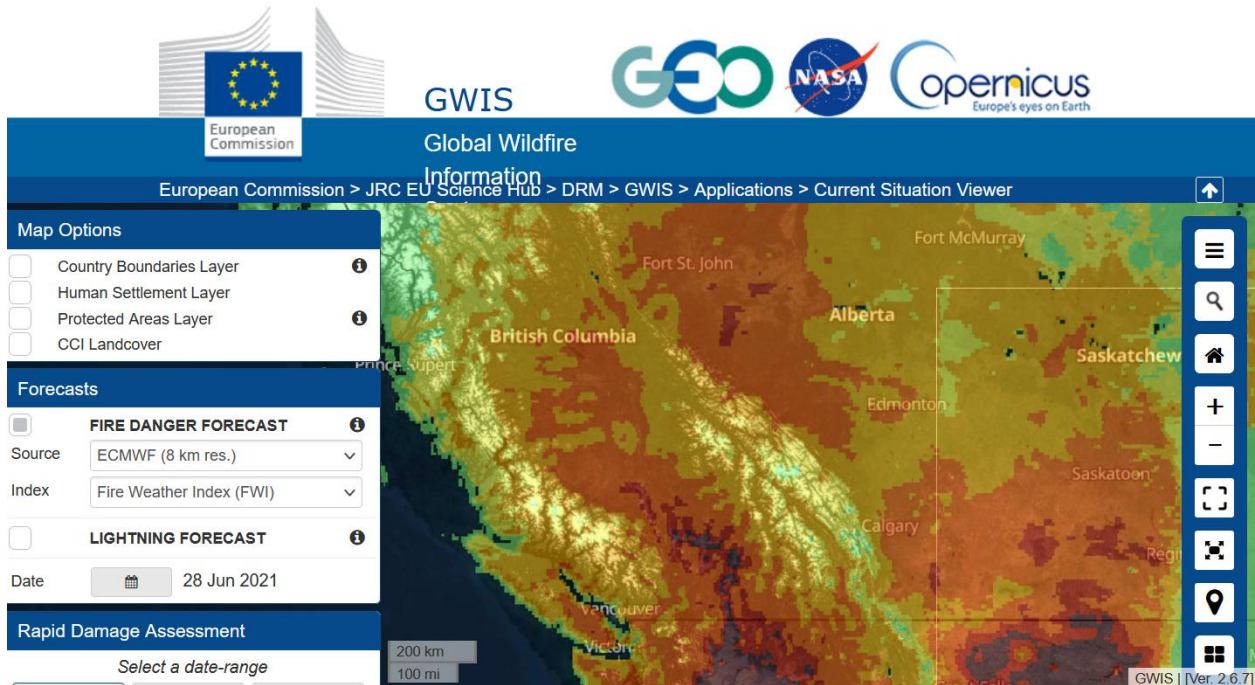
Within the **Current Situation Viewer**, you can add various **Map Options** and **Forecasts** layers along the left side. Along the right side you can modify and navigate around the map.

6. Move the map view to our study region in British Columbia.
7. Under the **Forecasts** tab, change the Date to **June 28, 2021** by clicking on the



Calendar icon

8. Turn on the Fire Danger Forecast Layer. This will automatically display the Fire Weather Index (FWI) that we have viewed before.



The GWIS has many other layers that were not available in Climate Engine, such as the Initial Spread Index, the Duff Moisture Code, etc.

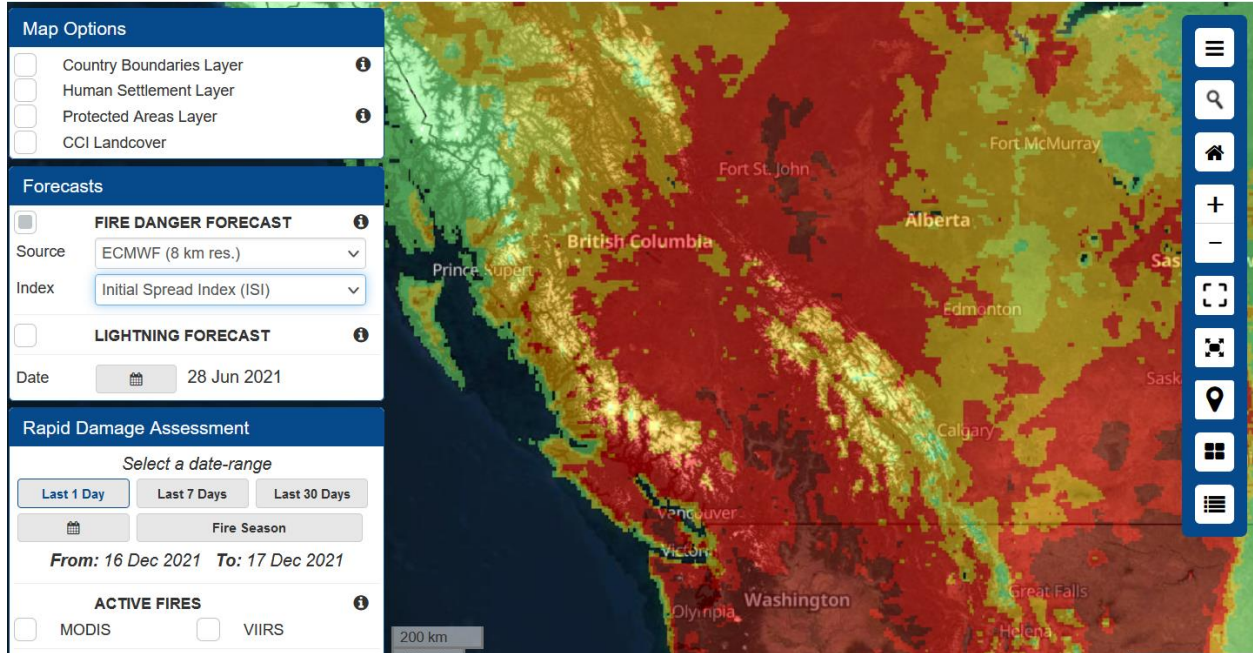
9. Click on the information icon next to **FIRE DANGER FORECAST** on the left panel.
 - a. Read through the technical information about each of these data layers. As mentioned in the lecture, there are many different fire danger methods and calculations and can be simple or complex.
 - b. Review the **Fire Danger** classes on the table shown here.
 - c. In the **Current Situation Viewer**, the colors corresponding to these ranges are:
 - i. Very low: white
 - ii. Low: Green
 - iii. Moderate: Yellow
 - iv. High: Orange
 - v. Very High: Red
 - vi. Extreme: Purple

Fire Danger Classes	FWI ranges (upper bound excluded)
Very low	< 5.2
Low	5.2 - 11.2
Moderate	11.2 - 21.3
High	21.3 - 38.0
Very high	38.0 - 50.0
Extreme	>= 50.0

10. Go back to the **Current Situation Viewer**

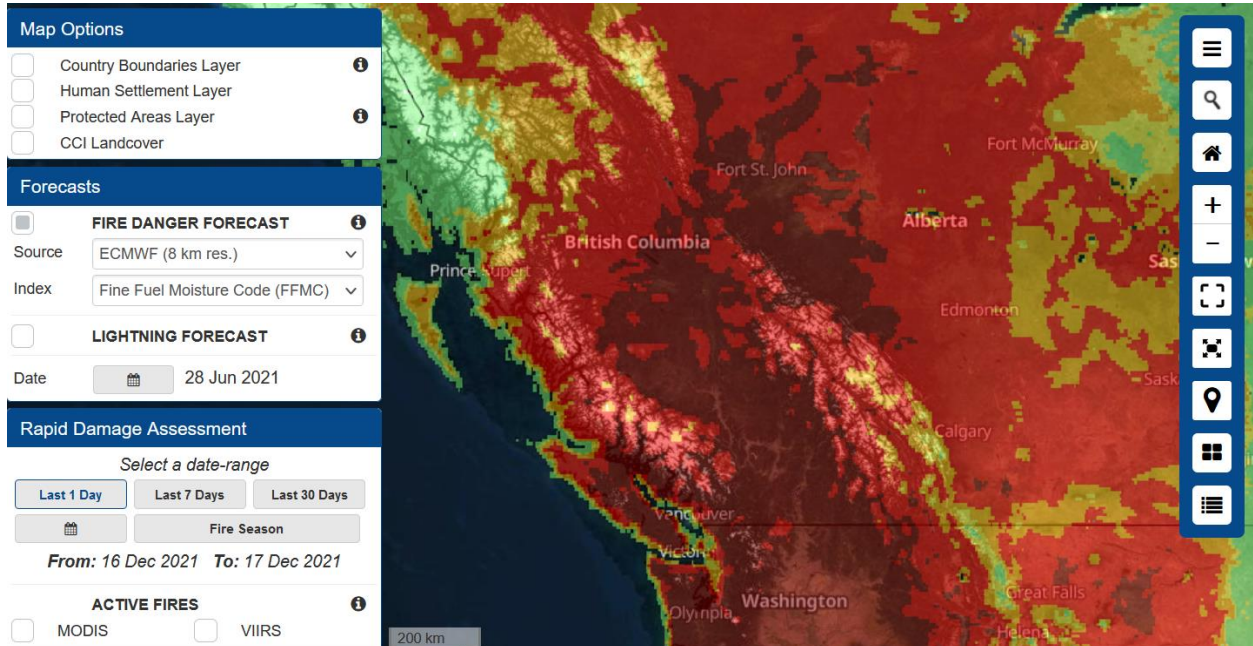
11. Under the **Forecasts** tab, change the **Index** to **Initial Spread Index (ISI)**

NASA ARSET Using Earth Observations for Pre- and Post-wildfire Monitoring
Exercise 1: Pre-fire Conditions of the Lytton, Canada Fires



Similarly, you can see that the ISI indicated that much of the region is experiencing high or extreme ISI values.

12. Under the **Forecasts** tab, change the Index to **Fine Fuel Moisture Code**



Here you can see that the fuels in this region are very dry, confirming what we have seen from previous analysis and increasing the possibility for large fire outbreaks and fire spread.

13. **Optional Steps:** Explore the different Fire Danger Forecast Options on the Current Situation Viewer. Explore different regions and time periods of areas or specific fire conditions you are interested in. We will come back to the GWIS Current Situation Viewer for our Bolivian Fires examples in the next exercise.

Conclusion

That concludes this exercise on pre-fire monitoring for the Lytton, Canada fire outbreak that occurred in June and July of 2021. We used various online webtools for exploring the pre-fire climate conditions and the landscape conditions. As we have discussed, there are many more variables to explore that can affect fire likelihood and spread. One primary are of interest that is beyond the scope of this training are components like landscape structure, canopy height, and canopy density which can be analyzed using more in-depth techniques through the use of Synthetic Aperture Radar (SAR) and/or Airborne Light Detection and Ranging (LiDAR).

Resources

- Climate Engine: <https://climateengine.com/>
- Natural Resources Canada: <https://cwfis.cfs.nrcan.gc.ca/background/summary/fwi>
- Global Wildfire Information System (GWIS): <https://gwis.jrc.ec.europa.eu/>
- NASA Global Fire Weather Database: <https://data.giss.nasa.gov/impacts/gfwed/>
- National Wildfire Coordination Group Fire Weather Information: <https://www.nwcg.gov/publications/pms437/cffdrs/fire-weather-index-system>
- Canada's Record Breaking Heatwave: <https://airs.jpl.nasa.gov/resources/228/nasas-airs-tracks-record-breaking-heat-wave-in-pacific-northwest/>
- CNN Article about the Lytton Fire: <https://www.cnn.com/2021/07/08/americas/canada-lytton-wildfire-climate-change-indigenous-intl-cmd/index.html>