

# EXERCISE 1

## LCMS Data Explorer



### Introduction

This exercise is designed to provide user guidance for navigating and downloading data produced for the USDA Forest Service's Land Cover Monitoring System (LCMS). The LCMS Data Explorer is the best resource environment for quickly viewing and downloading available data products. The LCMS Data Explorer is overlaid on a google maps style interface. This should help those already familiar with Google's suite of mapping products become more quickly familiar with the explorer.

The LCMS Data Explorer can be found by [clicking this link](https://lcms-data-explorer.appspot.com/) (<https://lcms-data-explorer.appspot.com/>).

### Objectives

- Learn how to navigate the LCMS Data Explorer web application.
- Download a data selection from the LCMS Data Explorer.

### Required Software

- A web browser other than Microsoft Internet Explorer.

### Prerequisites

- Basic understanding of how to use a simple GIS such as Google Maps or Google Earth.
- A study area or area of interest (AOI) within the LCMS mapped boundary.

### Contacts

- Ian Housman [ihousman@fs.fed.us](mailto:ihousman@fs.fed.us) 801-975-3366
- Seth Bogle [msbogle@fs.fed.us](mailto:msbogle@fs.fed.us) 801-975-3788



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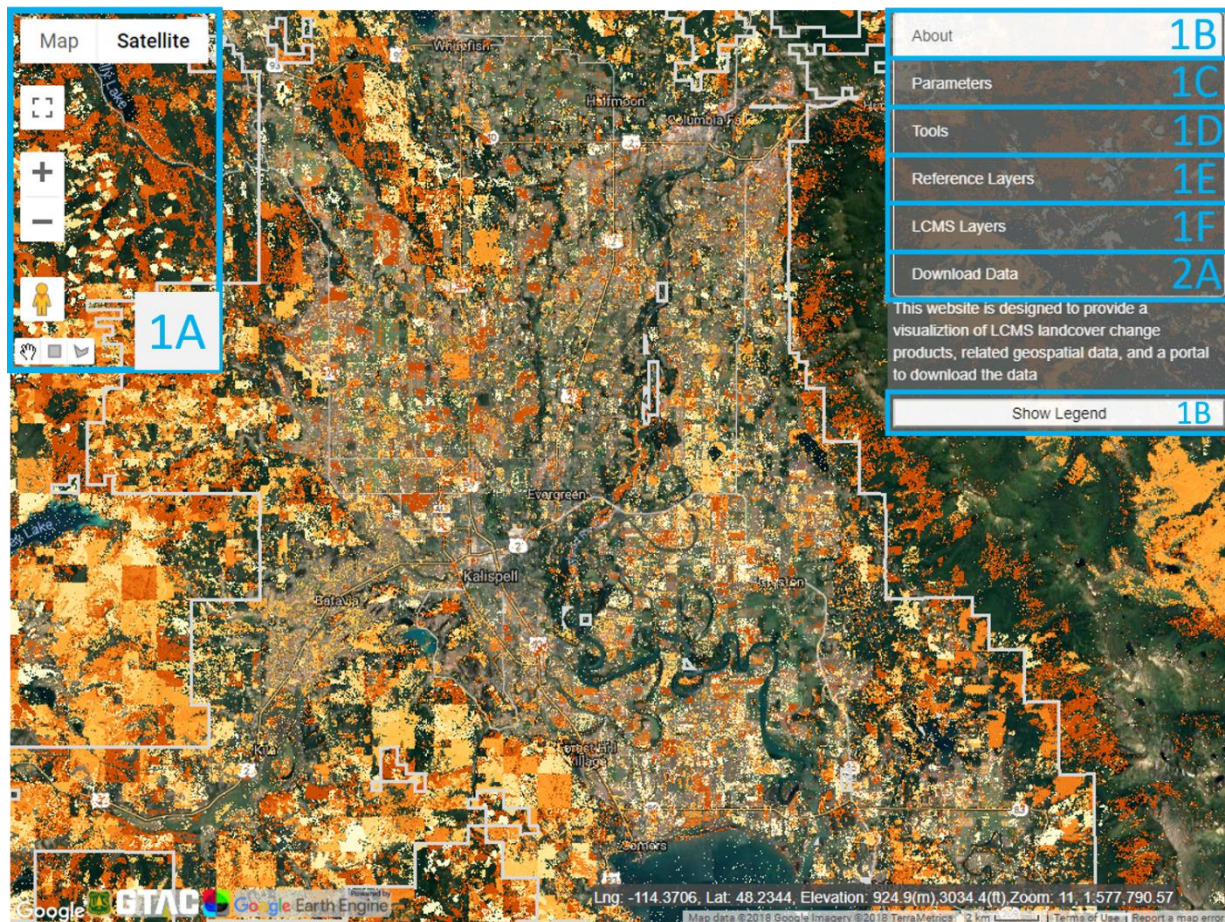
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## Part 1: Navigating the LCMS Data Explorer

This part of the exercise introduces the user to general navigation and functionality of the LCMS Data Explorer. To skip directly to an explanation of a particular tool set or tab use the guide image below. The **Part** number and **Section** letters are identified in Blue.





*Note: The image below does not contain links.*



### A. Explore the Google Tools

1. Launch the LCMS Data Explorer by [clicking this link \(https://lcms-data-explorer.appspot.com/\)](https://lcms-data-explorer.appspot.com/). We will begin by focusing on the tools along the left edge of your browser window. These tools are default tools preset within all web mapping applications using Google. Therefore, some of these are used in this exercise and some are not necessary.
2. At the top left you can choose between a map view and a satellite view for your base layer.
  - i. Map view has a checkbox drop-down option to turn terrain view on and off.
  - ii. Satellite view has a checkbox drop-down option to turn labels on and off.
3. Below the base layer options is a button to toggle full screen view on and off.
4. Next along the left edge are buttons to help you zoom in and out of the map.



- i. This can also be accomplished using the scroll wheel on your mouse.
5. The icon that looks like a small yellow person  allows you to drop into street view.
  - i. You can click and drag the person onto the map area. Any area that becomes highlighted in blue is available for you to drop the person to see surface level imagery in that area.
6. Lastly, and most important for this tutorial, are the pan and shape tools.
  - i. After clicking the pan tool  you can click and drag the map around to a desired study area.
  - ii. The box drawing tool  allows you to draw a rectangular box around a study. This will become important when you get ready to download data.
  - iii. The last tool in this row  allows you to draw an irregular shaped polygon by creating your own vertices. A double-click will close the shape.
7. If you drew any shapes during the previous step while experimenting with the tool, we will explore a way to delete these shapes during the data download section later in the exercise.

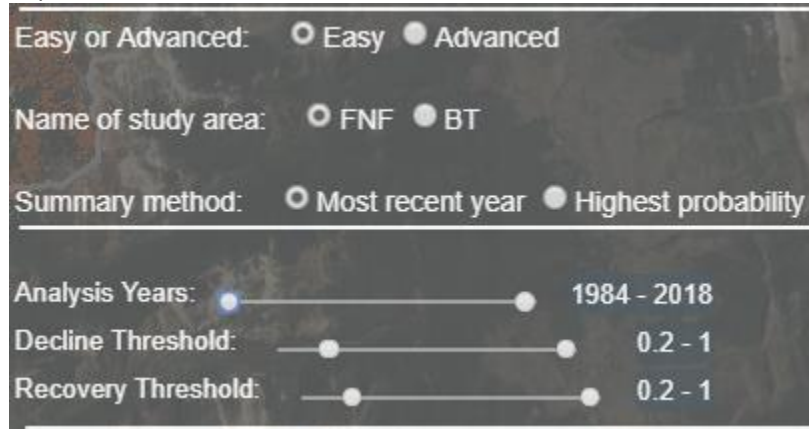
## B. Explore the LCMS Data Explorer GUI

1. Next we will focus our attention on the tools along the right edge of your browser window. These tools are the foundation of the LCMS Data Explorer and will be the area you focus most of your activity.
2. Begin by clicking the **About** tab at the top and read the information that appears at the bottom of the tab list.
3. Next, click the **Show Legend** button under the About text. Scroll through the list and take a look at the various visualizations that will become present depending on what data layers you select later in the exercise.
  - i. The legend can be toggled on and off by clicking this button and will always be available no matter what tab you choose within the GUI.

## C. Explore the Parameters Tab

1. Click the **Parameters** tab located directly under the About tab within the right pane.

2. Below the tabs list you will notice radio buttons where you can select Easy or Advanced mode. For the first part of the exercise let's stay on Easy mode. Advanced mode will be explored later in the exercise.



Easy or Advanced: ☐ Easy ☒ Advanced

Name of study area: ☐ FNF ☒ BT

Summary method: ☐ Most recent year ☒ Highest probability

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Analysis Years:  1984 - 2018

Decline Threshold:  0.2 - 1

Recovery Threshold:  0.2 - 1

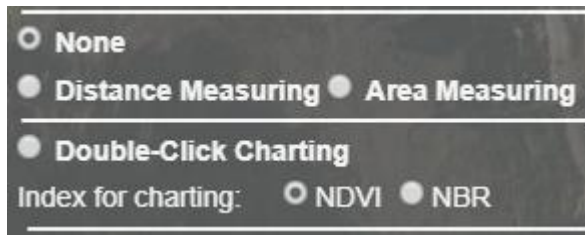
3. Below the mode selection, is a study area selection.
  - i. FNF – Flathead National Forest and Glacier NP
  - ii. BT – Bridger-Teton National Forest
4. The last radio button choice is for displaying data. The options are **Most recent year** or **Highest probability**.
  - i. As it implies, **Most recent year** will display the most recent year of occurrence above your specified decline and recovery thresholds.
  - ii. **Highest probability** will display the highest probability of decline or recovery within your selected thresholds.

*Note: Decline and Recovery are a proportion expressed as a decimal from 0.0-1.0. This value represents the proportion of classification trees within the Random Forest model ensemble that classified a particular pixel as decline or recovery. If the value is 0.0, none of the individual classification trees classified the pixel as decline or recovery. If the value is 0.5, half of the individual classification trees classified the pixel as decline or recovery. If the value is 1.0 all the individual classification trees classified the pixel decline or recovery. Decline and recovery are modeled independently so any one location can have some level of decline and recovery and can even express both within the same year.*

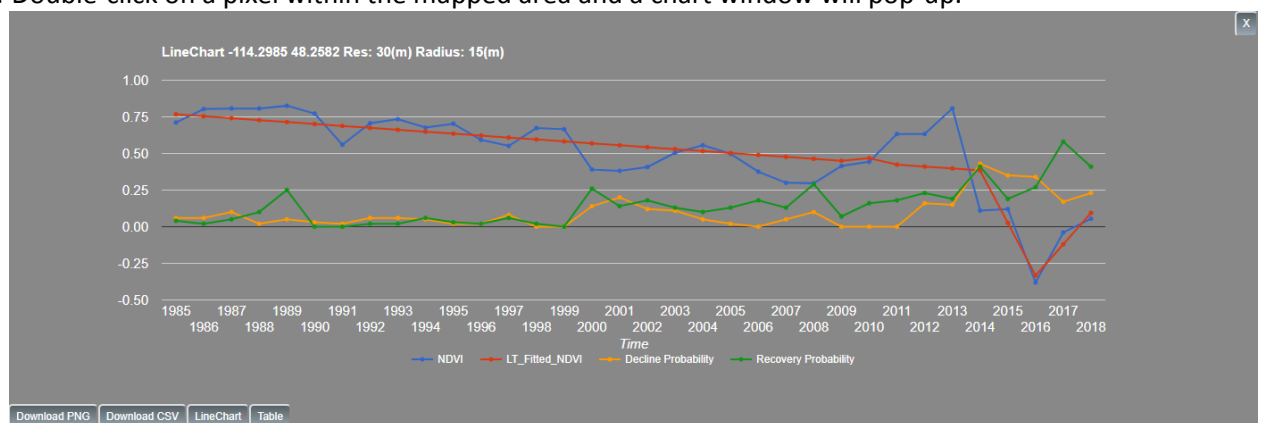
5. Below the radio buttons are sliders to refine your visualization and subsequent data selection. Take a moment to adjust these to see how the map changes.

## D. Explore the Tools Tab

1. Next, click the **Tools** tab.



2. This set of tools allows you to get some information directly from the web map without downloading data.
3. The first set of radio buttons allow you to measure distances and areas within the map. The measuring tools can be turned off again by clicking the radio button next to **None**.
4. Try each one making sure to pay particular attention to the additional buttons and dialogue pop-ups that appear on screen when hovering over the tool area.
5. Next let's explore **Double-Click Charting**. You can choose either NDVI or NBR as a reference index when exploring the resulting charts. This will make more sense after giving the tool a try.
6. Click on the button beside **Double-Click Charting**
7. Double-click on a pixel within the mapped area and a chart window will pop-up.



8. This line chart shows the decline probability and recovery probability data for the pixel you chose, across the years you chose in the Parameters tab, with NDVI and [LandTrendr](https://emapr.github.io/LT-GEE/index.html) (<https://emapr.github.io/LT-GEE/index.html>) fitted NDVI as the reference index.
  - i. The index can be changed to NBR by closing the pop-up, selecting the **NBR** radio button under Double-Click charting in the Tools tab and reselecting the pixel.
  - ii. This chart can be downloaded by choosing **Download PNG** in the bottom left corner of the pop-up.

9. Click the **Table** button on the bottom of the pop-up.

time	NDVI	LT_Fitted_NDVI	Decline Probability	Recovery Probability	
1985		0.711	0.767	0.06	0.04
1986		0.803	0.754	0.06	0.02
1987		0.807	0.741	0.1	0.05
1988		0.807	0.728	0.02	0.1
1989		0.825	0.714	0.05	0.25
1990		0.772	0.701	0.03	0
1991		0.56	0.688	0.02	0
1992		0.706	0.675	0.06	0.02
1993		0.734	0.662	0.06	0.02
1994		0.677	0.648	0.05	0.06
1995		0.703	0.635	0.02	0.03
1996		0.593	0.622	0.02	0.02
1997		0.552	0.609	0.08	0.06
1998		0.673	0.596	0	0.02
1999		0.665	0.582	0	0
2000		0.391	0.569	0.14	0.26

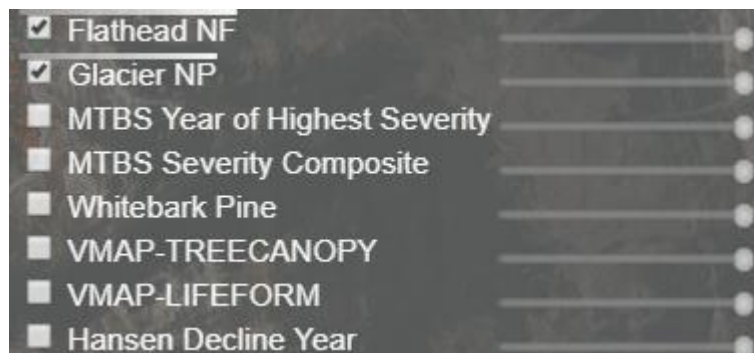
Download CSV LineChart Table

10. This data can also be viewed tabularly.

- This table can be downloaded by choosing **Download CSV** in the bottom left corner of the pop-up.
- Download CSV** can also be chosen while viewing the data as a chart from the earlier steps.

## E. Explore the Reference Layers Tab

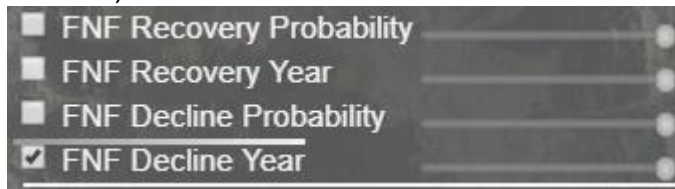
1. Click on the **Reference Layers** tab. This tab has boundary layers and other reference data you may be familiar with.



- Hover over each layer name and some will have additional text appear describing more about that layers.
- Each layer can be turned on and off by selecting the checkbox to the left of the layer's name.
- The opacity of each layer can also be adjusted with the slider to the right of the layer name.
- Remember the **Show Legend** button at the bottom of the GUI for more insight into each layer.

## F. Explore the LCMS Layers Tab

1. Click on the **LCMS Layers** tab. This tab is arranged similar to the Reference Layers tab above. However, this is the data this viewer was built for.



2. You can also hover over each of the LCMS layer names to see additional text describing the layer.
3. Like the reference layers, each of these can be turned on and off using the check boxes and the opacity can be adjusted using the sliders.
4. Again remember the **Show Legend** button at the bottom of the GUI.
5. Many users will find this information to be enough for the project they are working on. If you want to explore additional LCMS layers, see the Advanced options described in Part 3 of this exercise.

## Part 2: Downloading Data

This part of the exercise introduces the user to data selection and download functionality of the LCMS Data Viewer.



### A. Explore the Download Data Tab

1. Click on the last tab in the list on the right hand side of the browser, **Download Data**.
2. The Download Data tab is arranged into two groups. **Data Export Selection Tools** and **Data Export Tools**.




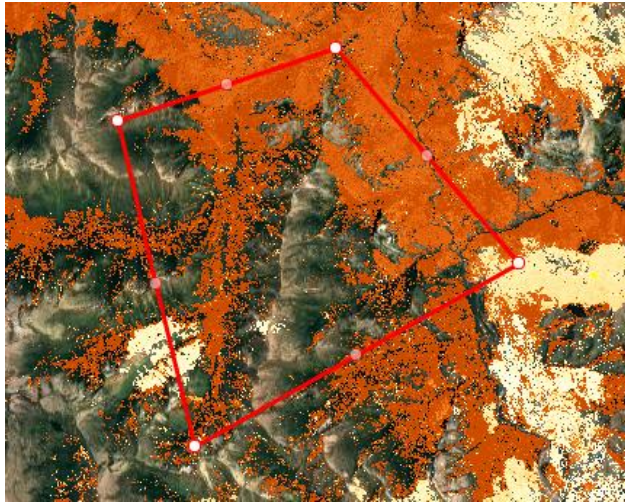
3. Let's begin by looking at the Data Export Selection Tools group. First, clicking the button on the top right **Clear All Shapes**. This will remove all the shapes you may have created during the first part of this exercise while we were exploring the drawing tools.

### B. Select an AOI

1. Zoom into an area on the map where you would like to focus your attention, or you can zoom out to the entire study area.
2. Use either the rectangle  or polygon  drawing tools on the left edge of the browser and draw around your study area.



3. Once drawn, you can turn these shapes on and off using the **Toggle Shapes** button.
4. You can draw multiple shapes if you wish. If you don't like a shape you have drawn, you can select it using the pan tool  from the left edge, and then press the **Clear Selected Shape** button under the Data Export Selection Tools group.
  - i. You know a shape is selected when its vertices become visible as white dots.



5. If you wish to start the selection process over completely, choose the **Clear All Shapes** button like we did just a few moments ago.

## C. Export Images

1. Next, let's export our selection using the buttons in the **Data Export Tools** group. This will allow us to use the LCMS data outside of the web environment, and in a GIS.
2. Click the **Export Images** button.
3. This will bring all available LCMS data layers, clipped to your selection window and to the parameters set within the Parameters tab
4. These appear in a new list visible just below the **Data Export Tools**.
5. You can change the name of your exports to make them easier to recognize when you download them.
6. You can also define a projection for your data different than the default.
7. Select the layers you wish to download with the check boxes and click the **Submit** button.
  - i. If for some reason you wish to suspend this process, it can be stopped using the **Cancel All Exports** Button.

*Note: Many things within the LCMS Data Explorer are cached. If you leave the web application and return at a later date, the previous view extent, shapes you have drawn as well as exports you have selected will be preserved for future use.*

## D. Download Images

1. Once your export selection has been processed, a pop-up window appears with download links for each of the layers you requested. Scroll down to make sure you get to each one.

2. Click each link and a raster file will be downloaded to your computer.

## E. Download Metadata file

1. One final step to help you best understand the data you just downloaded is to get the associated metadata file.
2. Click the **Download metadata** button under the Data Export Tools heading and read through to understand the various data formats, possible values for each layer and further data descriptions.
  - i. Contact information for help and troubleshooting can also be found within the metadata.

*Note: There is only one metadata file so you may notice descriptions of data that you didn't access during your selection. These additional data layers are available in advanced mode described in Part 3.*

## Part 3: Exploring the Advanced Mode

In the previous parts of this exercise we were using the LCMS Data Explorer in Easy mode. This part introduces the user to the **Advanced** mode. Not all tabs within the GUI will have advanced features. This part will highlight places to look, but relies on the user to go through Parts 1 and 2 on their own again and explore the advanced features.

### A. Selecting Advanced mode

1. Select the **Parameters** tab on the right edge.
2. Next, select the radio button next to **Advanced** and allow the data explorer to refresh.
3. At this point in the development of the LCMS Data Explorer, Advanced mode allows the user to explore additional LCMS data products.

### B. Explore the Tools Tab in Advanced Mode

1. Select the **Tools** tab on the right edge.
2. Explore Double-Click Charting with additional LCMS layers
  - i. Return to Part 1, Section D for guidance

### C. Explore the LCMS Layers Tab in Advanced Mode

1. Select the **LCMS Layers** Tab.
2. Notice the addition of several layers you may have found while exploring **Double-Click Charting**.
3. As before, hover over each new layer, a couple will have more information about that layer

### D. Explore the Download Data Tab in Advanced Mode

1. If you still have an AOI drawn on the map you can continue to use it or press the **Clear All Shapes** button and draw a new AOI.
2. Press the **Export Images** Button
3. Here you will see additional layers available for download for use outside of the web environment.



4. You can download these new layers using the steps outlined in Part 2 of this exercise.

**Congratulations!** You have successfully completed this exercise. You now know how to navigate the LCMS Data Explorer and download data for use within your own project.

