FluMapper Tutorial

Getting Started with FluMapper App

The FluMapper App provides users with an interactive web interface for visualizing and analyzing intensity of significant flu-risk using social media data.

Compared to other forms of flu surveillance, which usually focus on a specific spatial level (most often the state level) of administrative regions and/or update estimates weekly or daily,

FluMapper updates the estimation of flu risk for any location of interest every three hours at ten different spatial scales.

The FluMapper User Interface Components

The landing page of the FluMapper App consists of the following components:

1 *Pan* and *zoom slider* control buttons

2 *Legend* indicating levels of significant flu risk

- Indicates the level of significant flu risk (low to high) across space

3 *Menu/Animation Control Bar*

- Visualizes significant flu risk temporally every three hours, over a two-day period

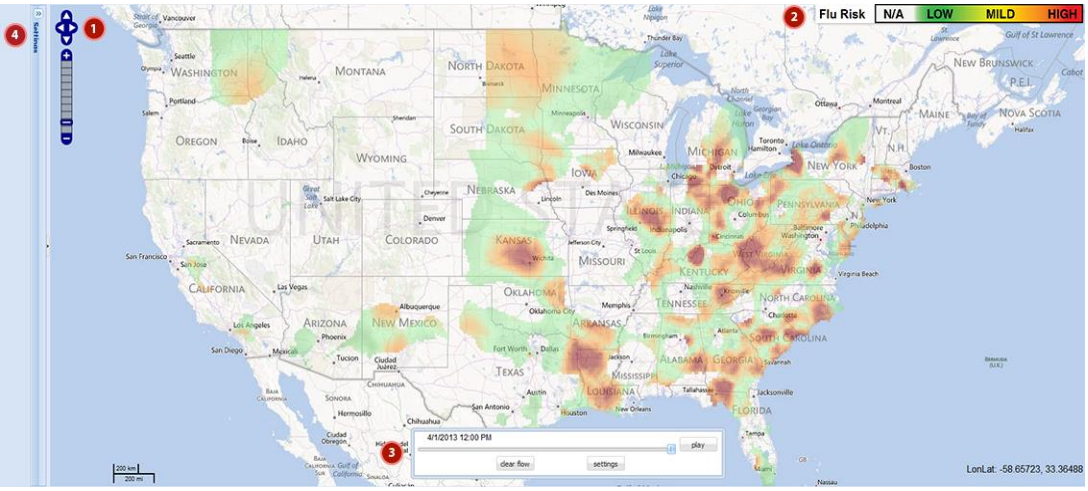
4 *Settings* panel

-
  - Controls the type of flu risk displayed on the map, aggregation level for trajectory flows, type of flows, and automatic redrawing option
  - Minimized by default
  - *Settings* button is also located on the *Menu* below *Animation Control Bar*

Users interact intuitively with FluMapper much like other similar web-based mapping applications.

Clicking and dragging the mouse across the screen or using the *pan feature* (above the *zoom slider*) to pan and move across different regions.

The *zoom slider* increases and decreases the spatial extent of the map. At the finest scale, the conterminous United States is represented as a uniform grid with cell size of 30 arc seconds.



Intensity of Significant Flu Risk

Upon accessing the FluMapper web interface, a user is presented with a map displaying significant flu risk across the conterminous United States.

The levels of flu risk are represented as color values on the flu risk Legend, ranging from green (low risk) to red (high risk).

Flu risk is considered significant after clusters of flu-related tweets are adjusted by the background population of tweets (total number of tweets collected).

Flu risk can be visualized over time using the *Animation Control Bar* in the *Menu*.

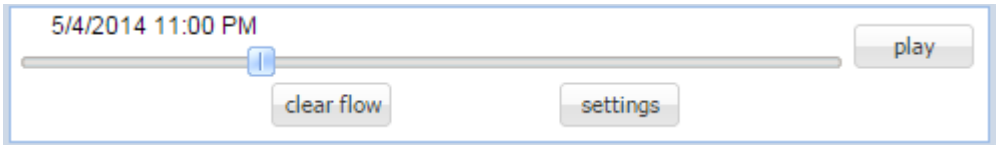
- When all layers in the map have fully loaded, the Play button will activate
- Pressing the Play button starts an animation that displays flu risk changes over geographic location and time, updated every three hours and displayed over the course of 24 hours

The Settings panel includes options for controlling the type of flu risk displayed on the map.

Explore FluMapper Menu

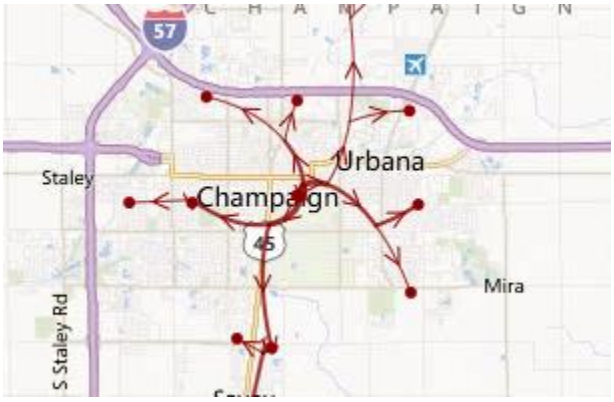
The *Animation Control Bar* feature in the *Menu* allows FluMapper users to visualize changes in flu risk over geographic space and time in three-hour intervals over a 24-hour period.

- Once the map has fully loaded, pressing Play on the *Animation Control Bar* displays an animated visualization of significant flu risk change over time, adjusted to the user's local time
- The user may click on the Pause button to stop the animation at any duration in time
- If the user increases the zoom level during a running animation, the *Animation Control Bar* will automatically pause to reload map features
- Once the map has fully loaded at the new zoom level, the user must select *Start* to resume the animation



The Clear flow function removes flow lines from the map.

Before *Clear flow* is applied:

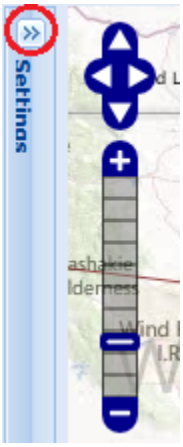


After Clear flow is applied:

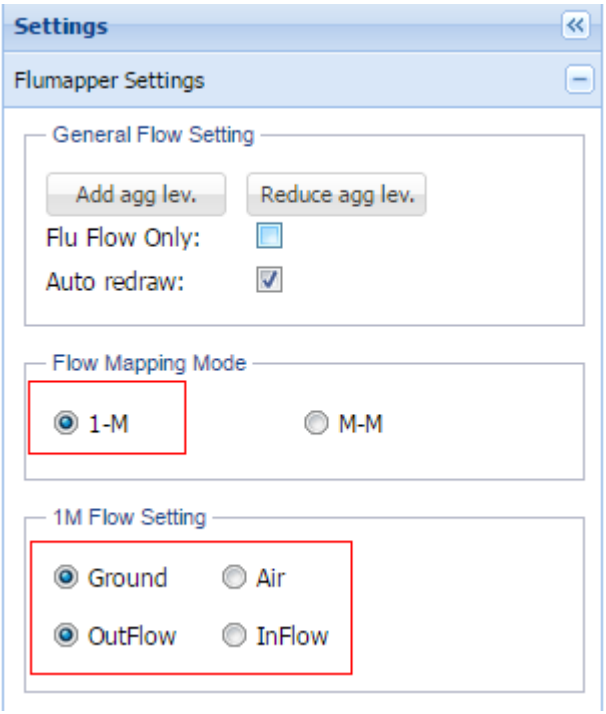
The Settings button displays the *Settings panel* on the left side of the screen.

- Clicking the Settings a second time will hide the *Settings panel*

Explore FluMapper Settings for Different Scenarios



The *Settings* panel can be shown and hidden by clicking on the arrow button at the top-left corner of the map.



Aggregation

- The *Add agg lev.* button displays less-detailed flow information.
- The *Reduce agg lev.* button displays more detailed flow information.

Flu Flow Only

- Selecting the *Flu Flow Only* option will only display flows with tweets that contain flu-related content.

Auto Redraw

- Selecting the *Auto redraw* option will automatically re-construct flow-line detail based on users' zoom-level changes.

Flow Mapping Mode:

- 1-M: It stands for one to many flow mapping mode, where a user click the map to select a location that indicate this area is the origin (OutFlow selected) or the destination (InFlow selected).
  - A user can have control to specify whether they are interested in flow generated on ground or air transportation
  - It is also available to distinguish the difference between in flows and out flows
- M-M: It stands for many to many flow mapping mode, which will visualize the inter-connections of flows among all the grid areas.

Understanding the Flows

Flows represent *Twitter* users' trajectory of movement over space and time, and appear when the user clicks any point on the map within the conterminous United States.

Data for displaying *flows* are collected using both the temporal and geographic information contained in a collection of tweets made by an individual (*Twitter* feed).

At the finest scale, the conterminous United States is represented as a uniform grid with cell size of 30 arc seconds. That's 1/3600 of a degree, or about 30 meters at the equator.

- Each point (node) in a *flow* represents a tweet sent from a specific place at a specific time
- Each red line represents a *Twitter* user's movement across space
- Arrows on lines signify direction of movement

A *flow* consists of multiple nodes connected by one or more lines.

- At the highest zoom level, *flows* with thicker lines represent large aggregations of individual *flows*

1-M flows

By default, the "flow mapping mode" is selected as "1-M" mode, where a user clicks the map to choose the area-of-interest to see how the flows from other parts of the US affect this particular area (InFlow),

or how the flows from this area affecting the other areas (OutFlow). In addition, a user can specify to visualize different flow patterns via "Ground" or "Air" transportation mode.

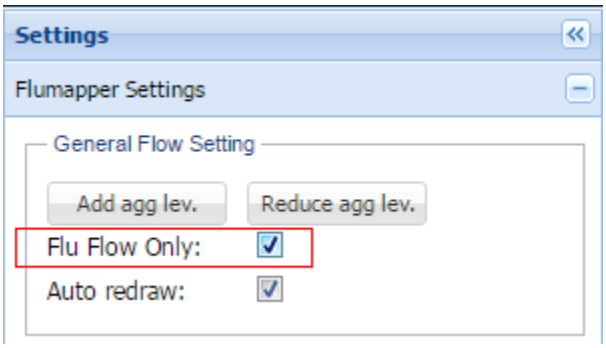
Flow Number

When a user hovers his/her cursor over a flow line, the total number of tweets between two points is displayed as a *Flow Number*.

- The line highlighted in green (shown above) informs the user from which trajectory (line) the *Flow Number* pertains to.
- As the user increases the zoom level, lines are thinner, aggregation is reduced, and flows are split into individual *Twitter* users' trajectories.

By default, flows are displayed using all tweets stored in the FluMapper database, regardless of flu-related content. To view flows that contain flu-related content only,

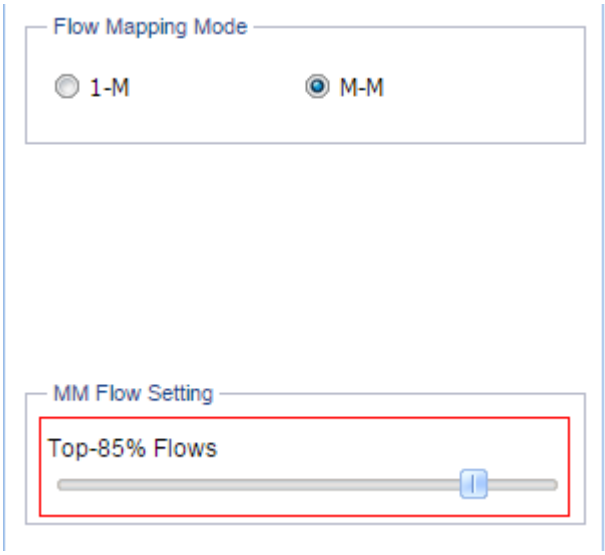
open the *Settings* panel on the upper-left corner of the screen and select the *Flu Flow Only* option (below, left).



M-M flows

A user can switch to "M-M" flow mapping mode, where the visualization shows the flow patterns among different areas all over the United States.

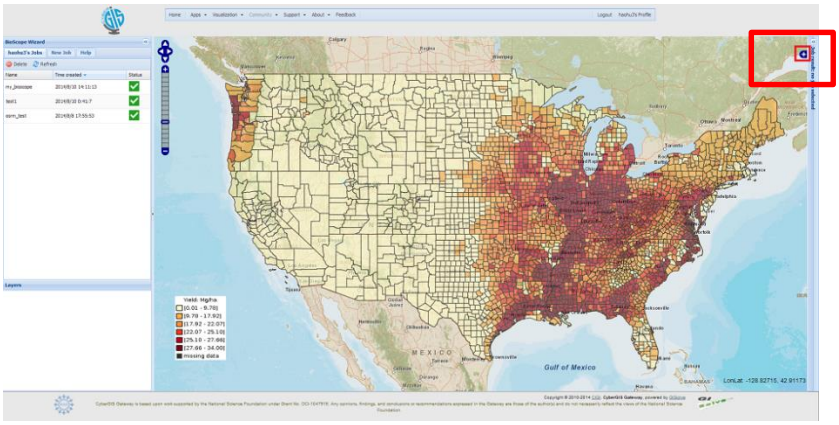
The percentage of how much flows should be visualized can be adjusted by the slider (seen to the right).



BioScope Tutorial

To start performing a new analysis using the BioScope app, simply click the “New Job” button to create a new BioScope analysis job.

Step 1 of 5: Change the Base Layer and the Crop Info Base Layer

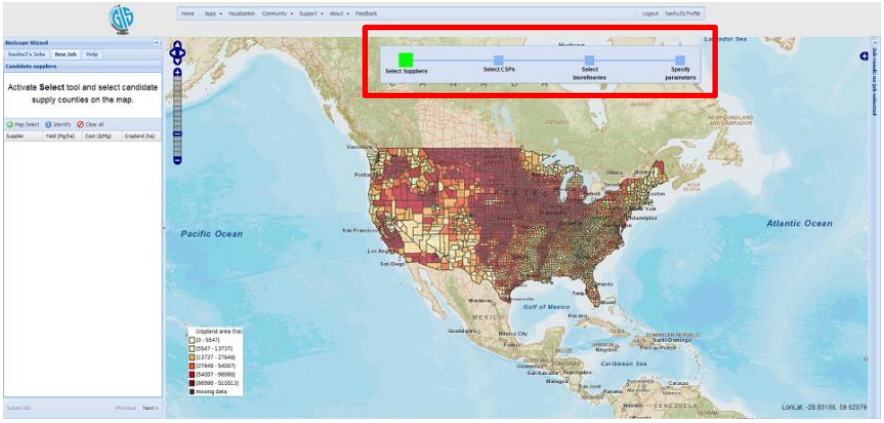


Click on the blue "plus" sign at the top right corner to select a base map with different styles.

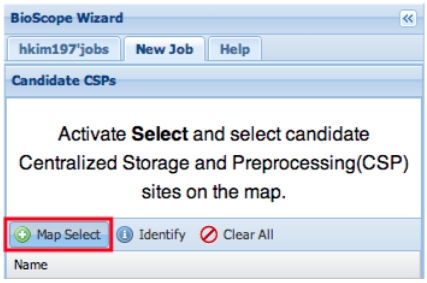
There are two options for the base layer: ArcGIS Online Street and ArcGIS Online Imagery.

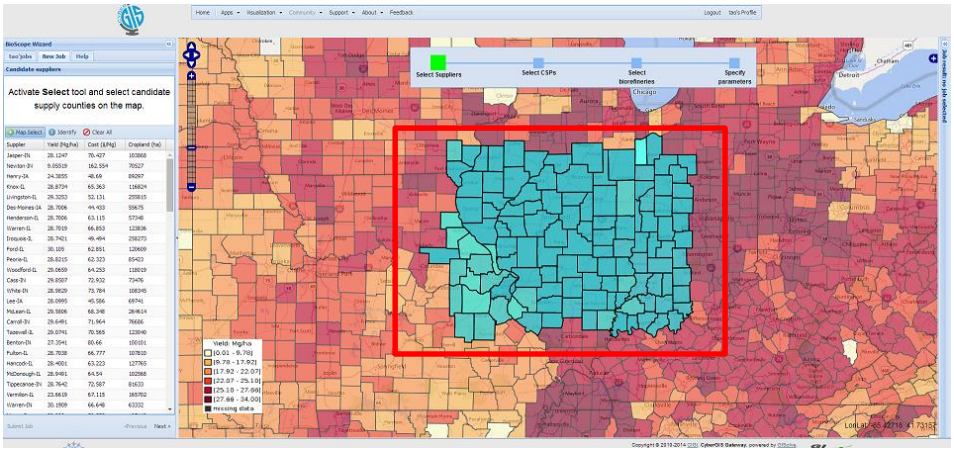
For the Crop Info Base Layer, there are three options, which include information of US Miscanthus yield (Mg per hectare), US Miscanthus cost ($ per Mg of biomass) and US Cropland area (hectare per county). Mg = megagram = metric ton.

Step 2 of 5: Select Candidate Locations for Biomass Suppliers



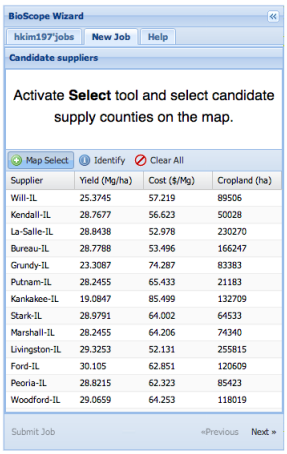
The website will show a status bar with four major stages for job submission. The first stage, namely, "Select Suppliers" will be automatically selected and is highlighted in color green.





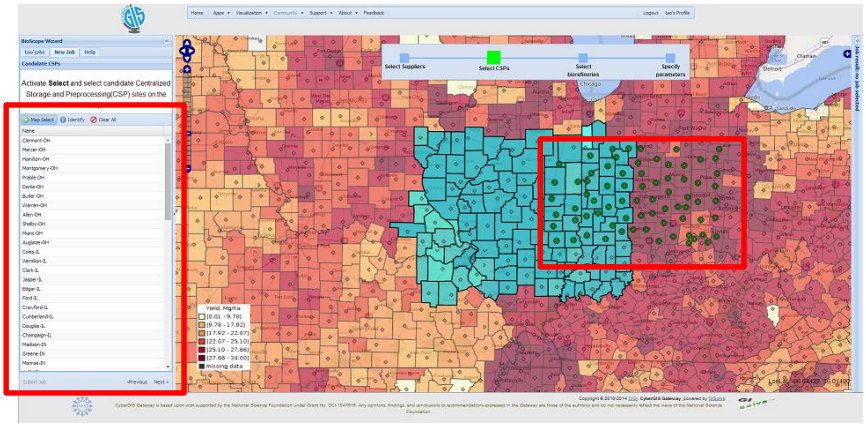
Activate "Map Select".Click and drag over a region from the map to select candidate locations. After selecting a region, your map should look something like this. **The selected area will be highlighted in blue**.

Make sure to choose a memorable set of candidate locations, such as all of the supply counties in one state, as we will be creating a second analysis to compare the results.



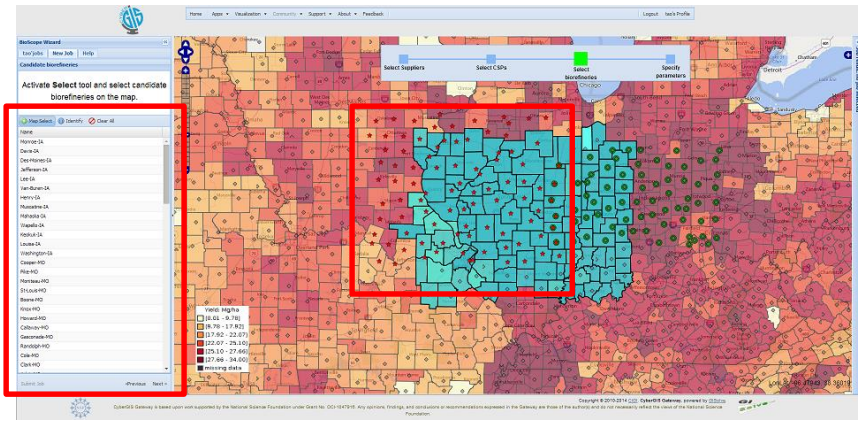
After selecting your counties, the control panel will show information on the Supplier, Yield (Mg/ha), Cost ($/Mg), and Cropland (ha).The data on Yield and Cost can be changed by users based on the understanding. Note: The cost data in some counties (mostly in western area) are missing, and they are assumed to be 9999 in the existing application.

Step 3 of 5: Select Candidate Locations for Centralized Storage and Preprocessing (CSP) Facilities



Click the box labeled "Select CSPs" or click "Next" in the left panel to move to the stage of CSP facility selection. Activate "Map Select". Click and drag over a region from the map to select candidate locations from the map. **The selected candidate locations for CSPs will be highlighted in green dots.** All the selected locations will be listed in the left panel.

Step 4 of 5: Select Candidate Locations for Biorefineries

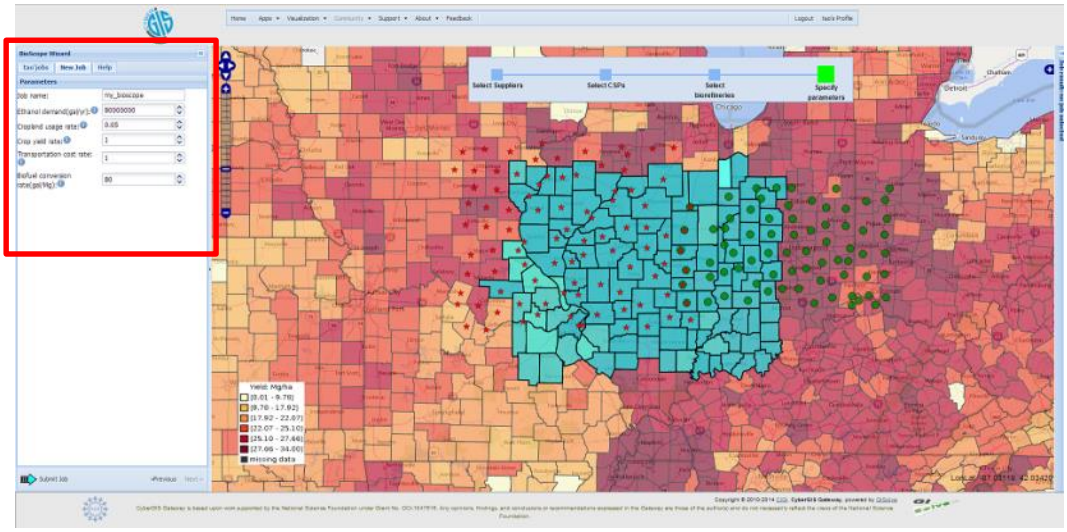


Click the box labeled "Select biorefineries" or click "Next" in the left panel to move to the stage of biorefinery facility selection. Activate "Map Select" to select candidate locations from the map. Click and drag over the area to select candidate biorefineries. **The selected candidate locations for biorefinery will be highlighted in red stars.** All the selected locations will be listed in the left panel.

Step 5 of 5: Specify Input Data Parameters

Click on the box labeled "Specify Parameters" or click "Next" in the left panel to move to the stage of parameter identification.

- Job name: define the job name for this case study.
- Ethanol demand: the total ethanol demand for this case study. The default value is 80,000,000.
- Cropland usage rate: the percentage of cropland in your selected supply counties that will be allocated to grow biomass. The default value is 0.05.
- Crop yield rate: the rate of crop yield as of the default value queried in the database. The default value is 1.
- Transportation cost rate: the rate of transportation cost as of the value used in the model. The default value is 1.
- Ethanol conversion rate: how many gallons of ethanol can be produced from each Mg of biomass. The default value is 80.



Submitting Your BioScope Job

Once all the spatial datasets are provided and all “decision parameters” are set accordingly, the created job is ready for submission. Click "Submit Job" in the left panel.

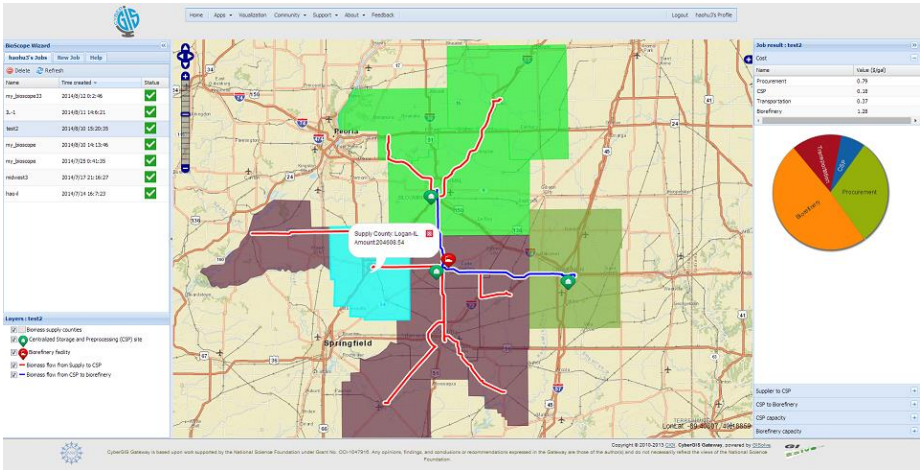
After submitting your first job, we will create a second job, which keeps everything in the analysis the same except the one parameter that is of the greatest interest to you. Repeat steps one through five and pick one parameter to change, such as the candidate Centralized Storage and Preprocessing sites, candidate biorefineries, ethanol demand, cropland usage rate, crop yield rate, transportation cost rate, or biofuel conversion rate.

State of Your Analysis

Refer to the table below for the current status of your analysis.

Icon	Status	Icon	Status
	Analysis submitted for computation		Results created
	Analysis waiting to be executed		Results ready for visualization
	Analysis running	No Icon	Computation problem
	Computation done		

Viewing Your Results

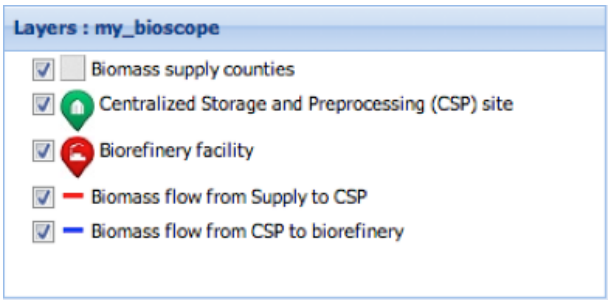


Once the results from the submitted analysis are created, which is indicated by the  sign, **double click** on that job to view results. The result page consists of three major panels:
Left panel has job lists and result panel information.
Middle panel shows the spatial visualization of optimal supply chain configurations on the map. Right panel shows the detailed result information.
If user clicks the selected supply counties, supply to CSP path or CSP to biorefinery path, the selected feature will be highlighted and a pop up window will show the details.

Result Visualization

Note: Loading results on map may take a while, depending on result size and Internet connection.

In the *Layers* panel, there are five layers of results are generated:



1. Biomass supply counties
2. Centralized Storage and Preprocessing (CSP) site
3. Biorefinery facility
4. Biomass flow from Supply to CSP
5. Biomass flow from CSP to biorefinery

By ticking the check box of each result layer, a corresponding map feature will be overlaid on top of the base map, which is illustrated in the image below.

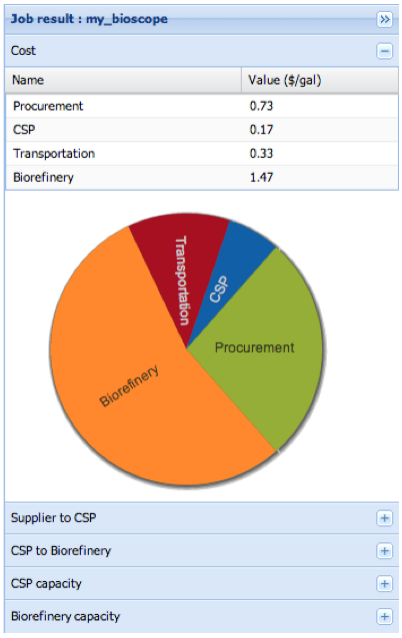
Each colored region indicates that all the counties in that color schema share the same CSP facility that is located in the region.

Job Results Panel

This panel shows the detailed optimization result information in five sub-tabs.

"Cost" tab shows the detailed biomass-biofuel production costs. All the cost values have been converted into $ per each gallon of ethanol production.

- Procurement represents the biomass procurement costs from all biomass suppliers.
- CSP represents the centralized storage and preprocessing related costs.
- Transportation represents the costs related to biomass transportation.
- Biorefinery represents the costs related biorefinery production.



"Supplier to CSP" tab shows the optimal biomass transportation patterns from supply counties to CSP facilities.

"CSP to Biorefinery" tab shows the optimal biomass transportation patterns from CSP facilities to biorefineries.

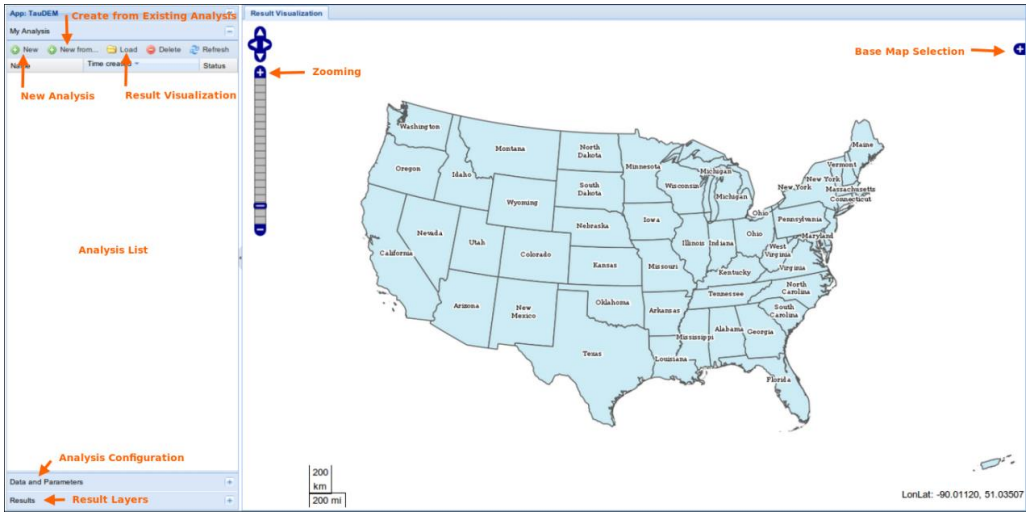
"CSP capacity" tab shows the location and capacity information for each CSP facility.

"Biorefinery capacity" tab shows the location and capacity information for each biorefinery facility.

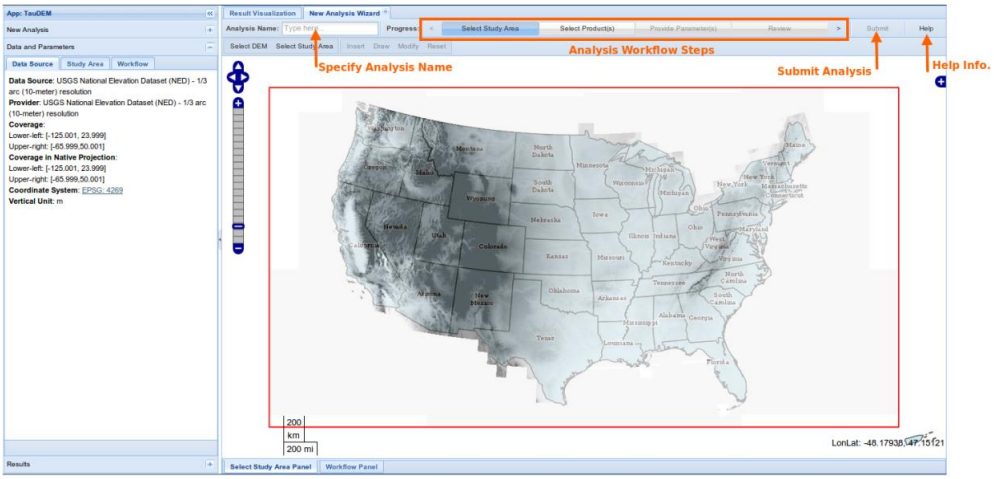
TauDEM Tutorial

After login, please select the TauDEM app on the "Apps" menu. The app interface has two main components of the TauDEM app.

1. Map panel (right)
2. "My Analysis" control panel (left)



Creating a New TauDEM Analysis



You can create a new TauDEM analysis by "New" or "New from...". "New from..." will ask you to select an existing analysis and load the configuration of that analysis to construct another analysis.

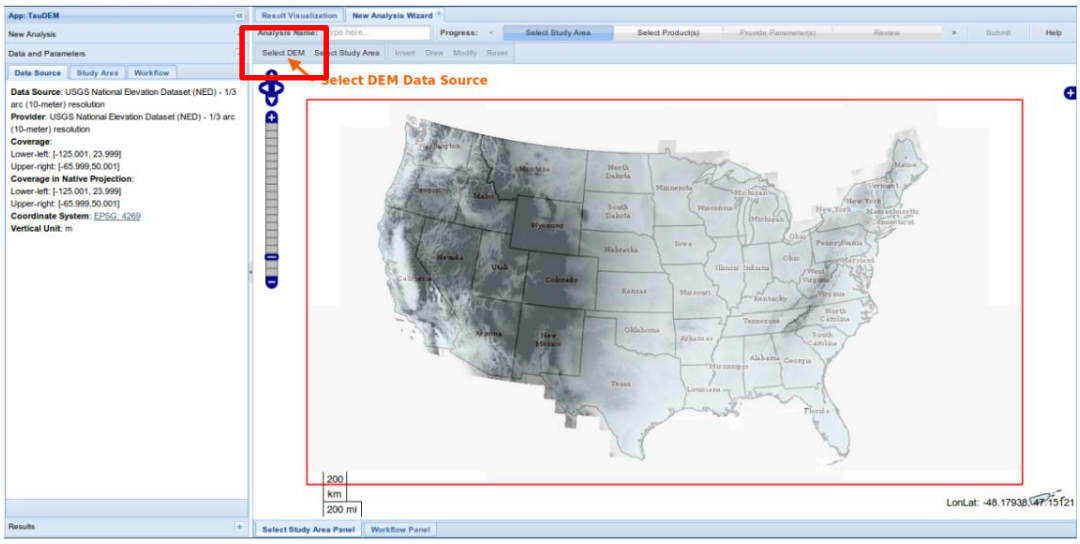
Note: Currently, this version of TauDEM app does not yet support the reuse of previous analysis output data as new analysis input data sources. That means, if you use "New from...", only DEM source, study area, and parameter configuration are loaded from previous analysis, not data. You still need to select dependent TauDEM functions. For example, if you have a finished analysis that produced a stream grid (.src) using product 14 "Contributing Area Stream Raster", now you want to do product 17 "Move Outlets". You can do "New from..." from the product 14 analysis, you still need to select (rerun) product 14 to generate a stream grid, in addition to product 17 during analysis construction.

A new analysis will not be saved until you click "Submit".

To create another new analysis, you MUST close the "New Analysis Wizard" first

Step 1 of 7: Select DEM Data Source

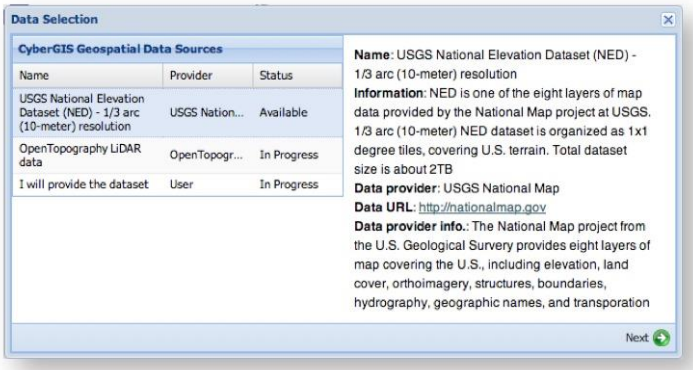
Click "Select DEM" to select DEM data source.



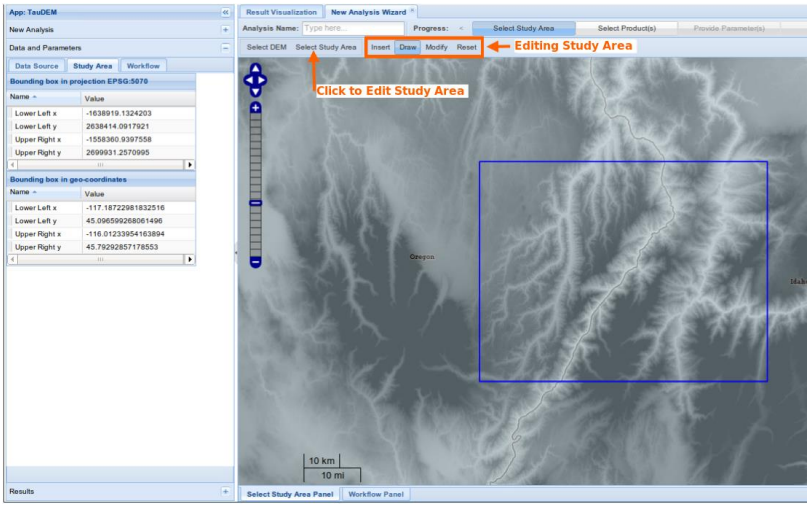
There are three dataset options for choosing elevation data:

1. USGS National Elevation Dataset (NED)
2. OpenTopography LiDAR Data
3. Providing your own dataset

Currently, only USGS NED is supported.



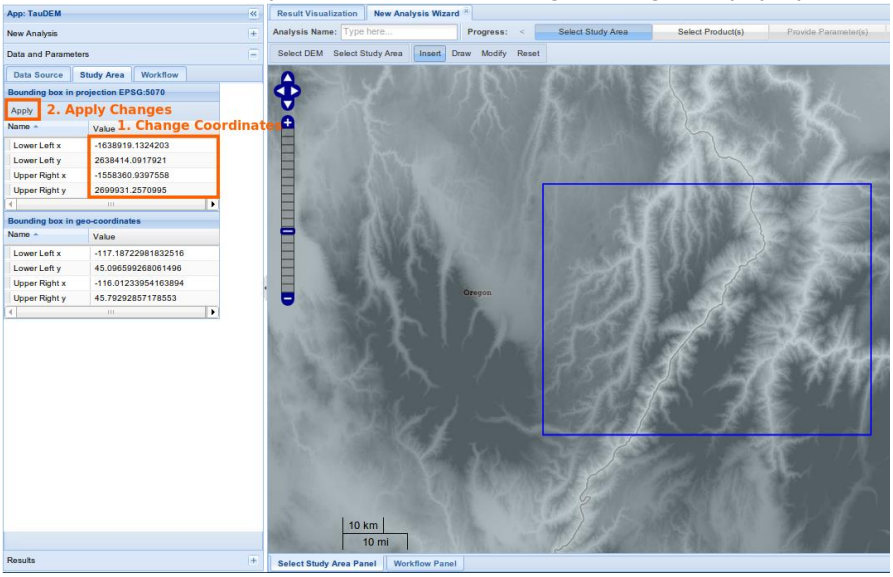
Step 2 of 7: Select Study Area



Click "Select Study Area" to start drawing a study area bounding box.

"Draw" allows you to draw a bounding box on the map. If the bounding box is too big, it is considered a zooming operation; if too small, you receive a warning message. When the size is appropriate, a blue bounding box is drawn.

Note: Currently study area size is limited to be less than 100 million cells (10,000 square kilometers for the USGS 1/3 arc NED). If exceeded, a warning message will pop up.



"Insert" allows you to change the coordinate values of a bounding box.

"Modify" allows you to change the position and size of the bounding box on map.

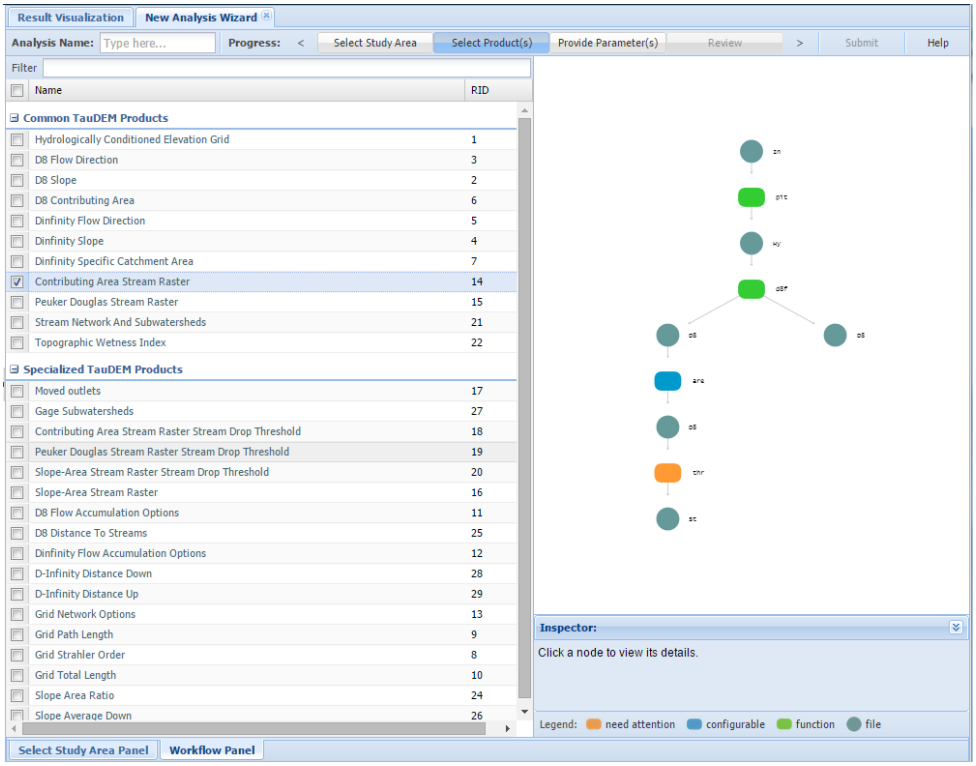
"Reset" removes a drawn bounding box. You must draw again before proceeding to next steps.

A valid bounding box must exist before you move on to the next step.

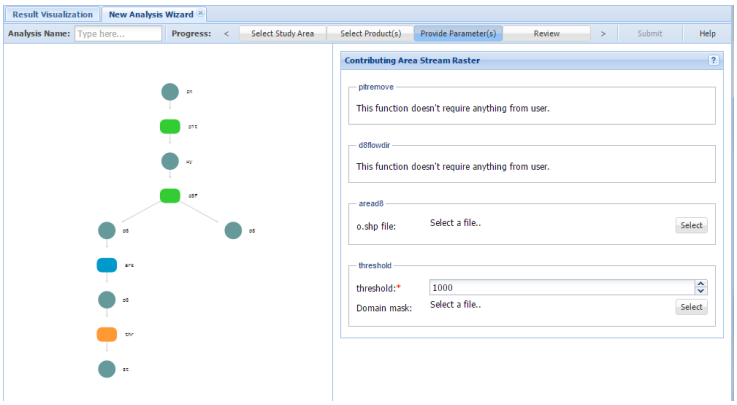
After a proper study area is selected, go to next step, which is "Select Product(s)".

Step 3 of 7: Product Selection

If a selected product depends on other products, a warning message pops up to indicate the dependent products. For today's purposes we will be demonstrating the Contributing Area Stream Raster, which is an indicator grid (1,0) that indicates the location of streams, with a value of 1 for each of the stream cells and 0 for the remainder of the cells. Streams here are identified using a threshold applied to the D8 contributing area grid. Larger values mean a larger area contributes to the flow in the grid cell. Cells with value greater than or equal to the input threshold are mapped as streams, while other grid cells are mapped as non stream grid cells.



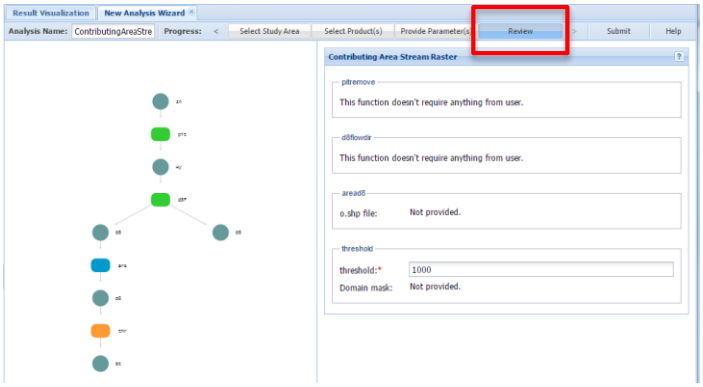
Step 4 of 7: Specify Parameters for each TauDEM Function



Once the product(s) are selected, go to the next step to set parameters needed for each TauDEM function.

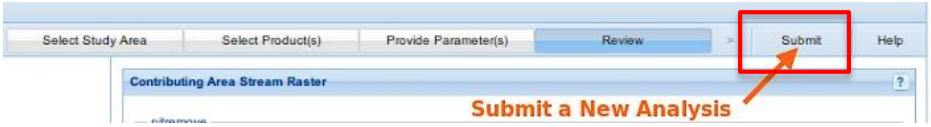
Increasing the threshold will reduce the number of streams.

Step 5 of 7: Review Analysis Configuration



If there is any issue with product selection and parameter setting, please fix it, then go to next step.

Step 6 of 7: Submit Analysis



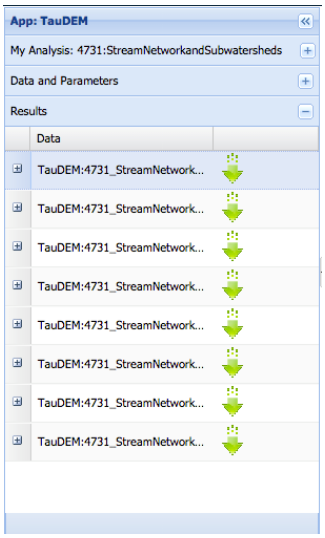
After reviewing, click Submit button, the analysis job will be submitted and will begin computing. It may take some time for the analysis to be executed because the computing resources used in CyberGIS Gateway applications are on infrastructure shared by many other users from a broad range of institutions and scientific domains. Your newly submitted job analysis should be listed on the Analysis List, listed under My Analysis. You may click *Refresh* to update the status. Once the status reaches "Ready for Visualization," double-click the analysis or click the *Load* button to view results.

Note: If the analysis is not ready for visualization, loading it will only show the configuration of the data source, study area, and viewpoints.

Step 7 of 7: Submit Comparison Analysis

After submitting the first analysis, we will create the same analysis with a different threshold. To do this, select your original analysis and then click “New from…”. This will load the study area of the selected analysis. To finish the second analysis, repeat steps four through six. Try choosing a larger threshold value.

Status of Your Analysis



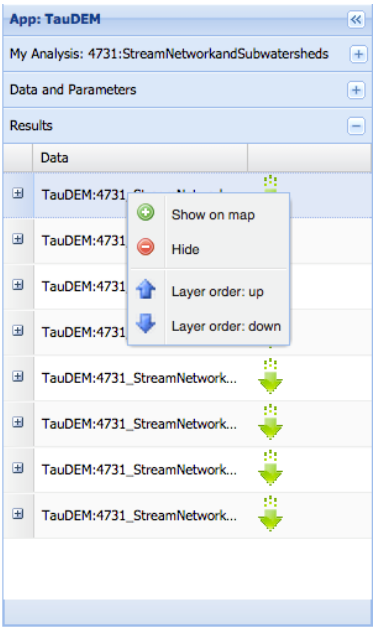
Once you have submitted your analysis, a hammer icon should appear under the status column in the “My Analysis” control panel. Once the results are ready for visualization, a map with a magnifying glass should appear. Please refer to **page 10** for a full list of icons and what they represent.

Once your analysis is complete, double-click your analysis to proceed to *Results*, and an image like the one to the left should appear.

Note: Loading results on map may take a while, depending on result size and Internet connection.

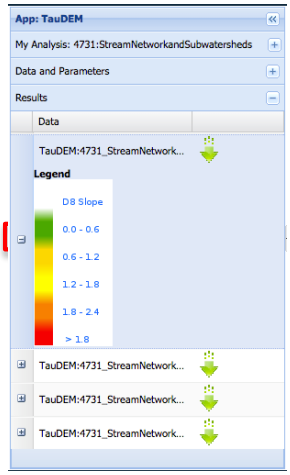
The results should load in the control panel.

Hiding and Moving Layers



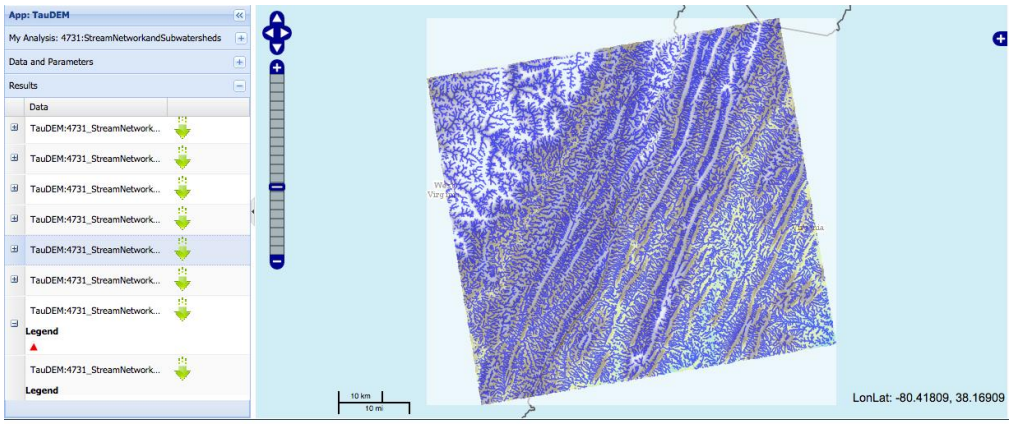
You may choose to reorder the layer of your results. Simply right click on the results to do so. Show or hide the results by right-clicking as well.

View Legend



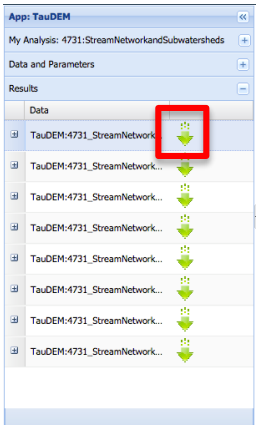
Click on the plus sign left of the data to view the corresponding legends for each result data.

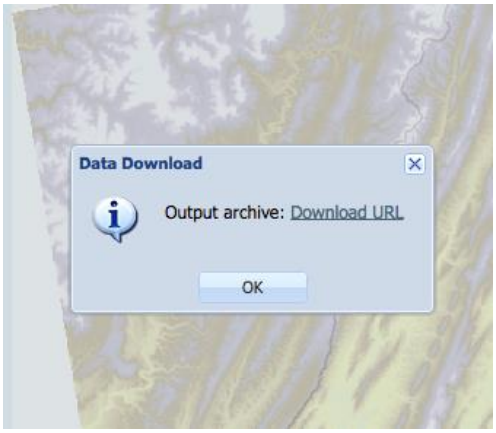
View Your Data



Your data should appear on the map similar to the adjacent map.

(Optional) Downloading the Result Data





For each layer, you can click the green arrow to download the result data. A pop-up should follow. Click “ok” to download the data.