RESULTS VERIFICATION AND VALIDATION

INDIVIDUAL MAP UNIT PERFORMANCE

Once you have successfully run the models, the results will be available in the Reports tab of the Project Workspace. Within the Reports tab there are three sub-tabs that let you explore the results in various formats: Table, Chart, and Map (Figure 1).

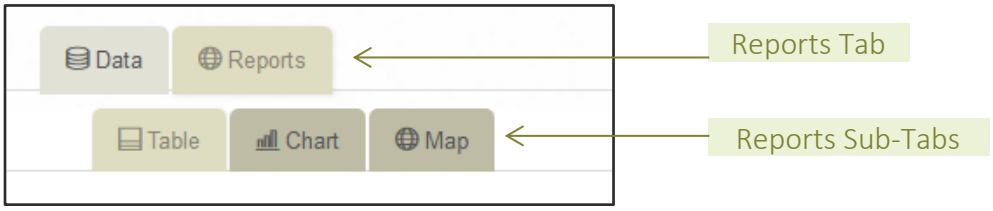

Figure 1. Reports Tab and Sub-Tabs for accessing tabular, charted and map data

The best way to begin reviewing your results is to look at them in terms of the individual map unit scores. This is an important step because the remainder of the comparisons of Site results builds upon these individual scores.

HEAT MAPS

Heat maps color-code the performance of functions or services. The easiest way to perform an initial review of the map unit-level data is to look at the values as presented in heat maps. To review the heat maps, first open the Site to be reviewed, then click on the Map sub-tab of the Reports tab. This opens a map view of the Site with map unit colors scaled according to the individual map unit percent performance scores (Figure 2).

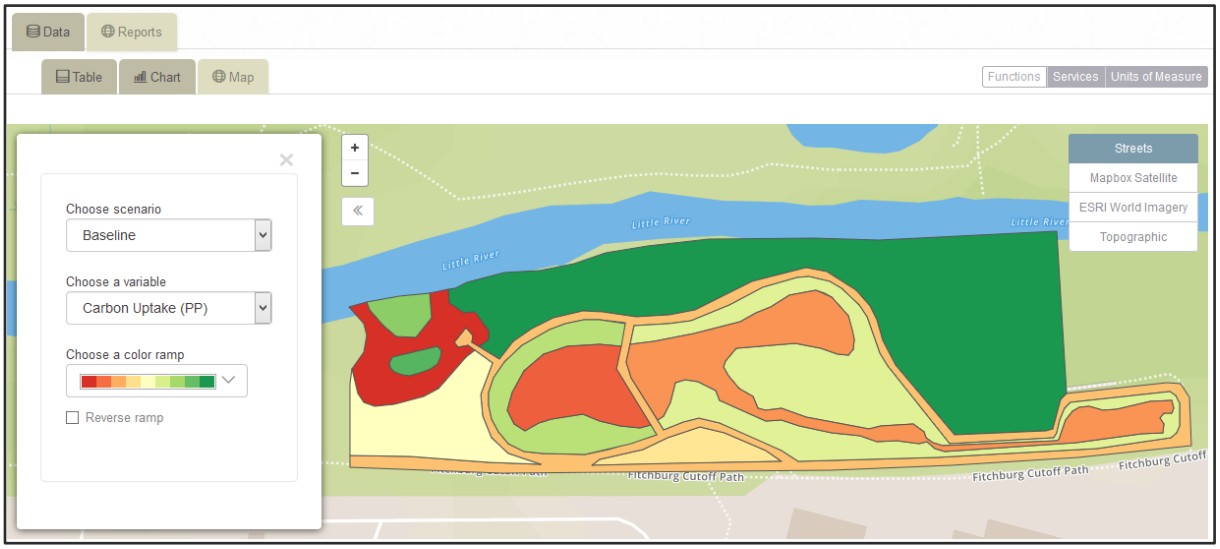

Figure 2. Heat map and window for choosing heat map display options

Additionally, the pop-out box to the left of the map lets you choose the Scenario to review, the variable (function or service) to view on the heat map, and the color ramp[1] to visualize the data. (Figure 3).

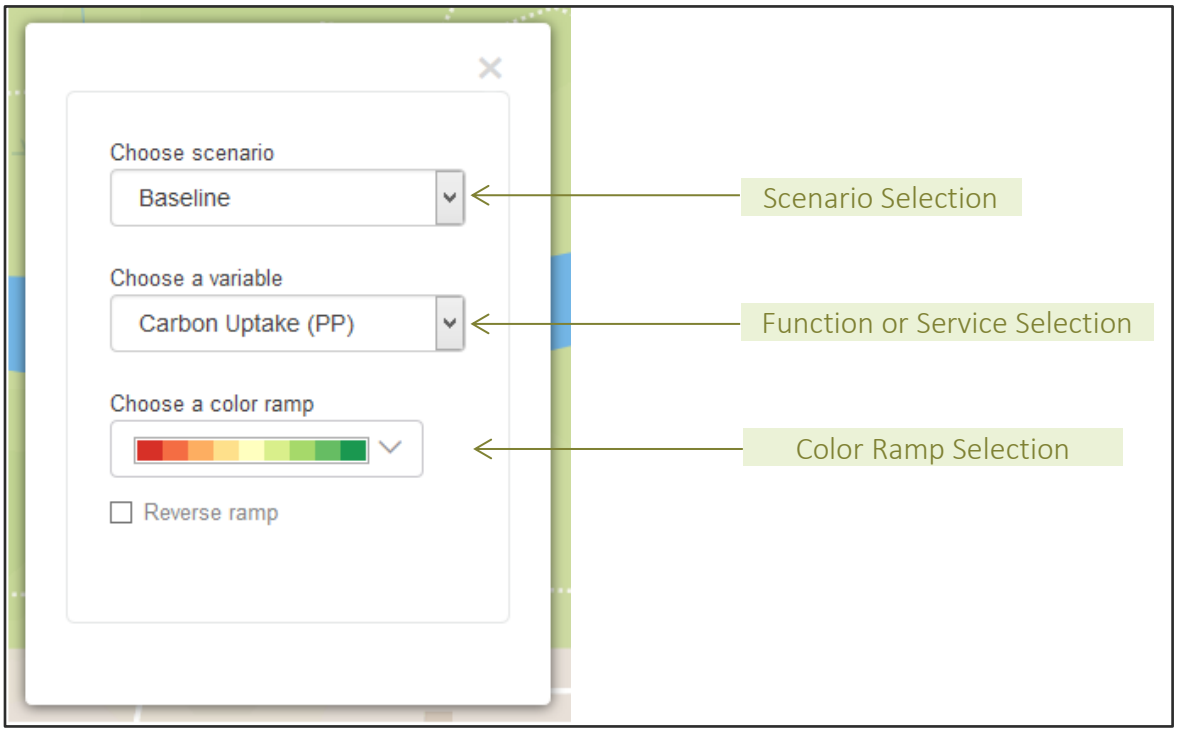

Figure 3. Window in which to choose heat map display options

To perform the initial map unit review, open the heat map view and select one of the available functions or services from the dropdown menu. Quickly scan the Site map, looking for places where one or a few map units differ dramatically in color. This will reveal scores that differ significantly within a sub-area of a Site. In Figure 4, for example, we see a Site where all of the map units are red (indicating low performance in this example) except for one map unit in the northwest corner, which is green (indicating high performance).

[1] A color ramp is a spectrum of colors that can be used to show gradation in values according to their magnitude. For example, a common color ramp is red transitioning to green, with red representing low scores and green representing high scores.

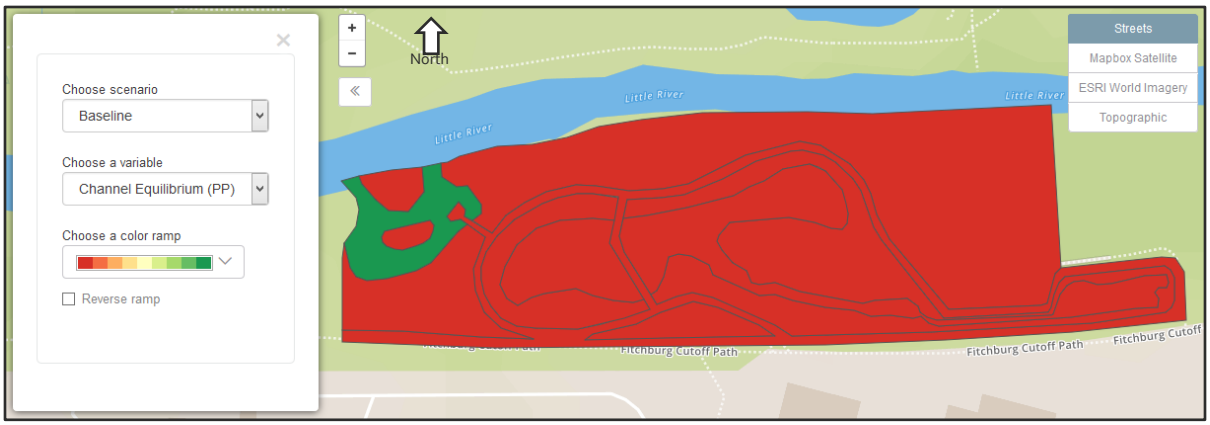

Figure 4. Heat map showing a map unit with a potential outlier score (green) contrasting strongly against surrounding map units (red)

Extreme contrasts, as in this example, identify places where you might expect there to be an error. In such a case, you should check whether there are differences in habitat type or land use that might reasonably explain the results or whether there may have been errors in data entry. For example, if the green map unit represents a paved path surrounded by a forest, the difference in the scores between these map units is likely due to the differences between the path and the forest, not to errors in data entry. In the case above, the green map unit is a small side-channel of the river to the north of the Site, with no other channelized aquatic map units in the Site. This information on habitats and land uses provides support for the conclusion that the high score for the Channel Equilibrium[2] function in this map unit is due to differences in observed ecological attributes, not to errors in data collection.

However, if the map unit habitat type in Figure 4 was similar to surrounding map units, you should go back to the Data tab, select that map unit, and review the data that was entered into the survey. You can do this by scrolling through the various questions and checking to be sure that they were entered correctly (Figure 5).

[2] Channel Equilibrium is an ecosystem function. Its model in the ESII Tool predicts the integrity of a moving water channel when compared against depositional or erosional forces exerted on that channel by the aquatic system.

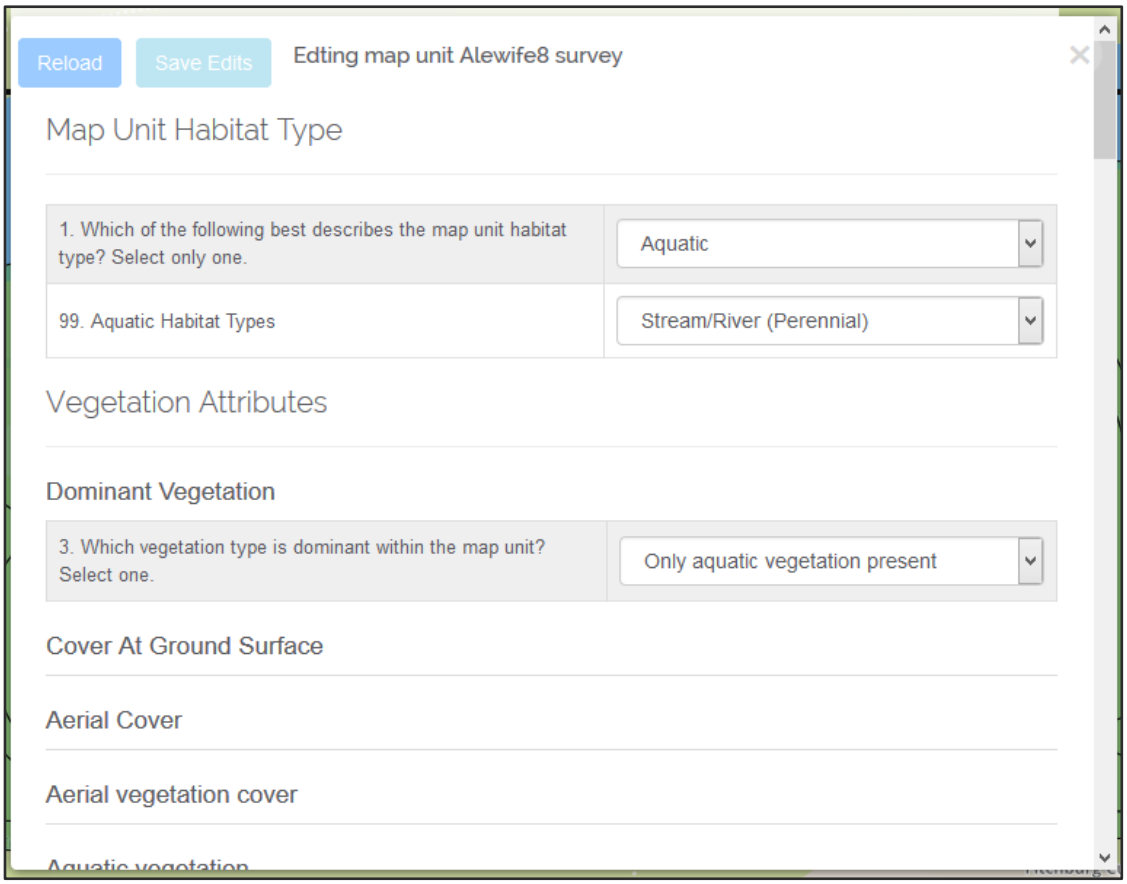

Figure 5. Project Workspace map unit survey data review

OUTPUT TABLES

Another way to verify map unit-level output data is to view the modeling results in the form of output tables. Clicking the Tables sub-tab under the Reports tab will display Site-level summary data for the various Scenarios. At the bottom of this page, several buttons are available (Figure 6) that allow the download of output tables for a specific Scenario or for all Scenarios in the DCE within one CSV format.

Figure 6. Export options for model results in the Project Workspace. 'Export Data' buttons download individual Scenario results while the 'Export Summary Data for Functions' button downloads all Scenario results within the DCE.

To review map unit level output data for a given Scenario, click the **Export Data** button at the bottom of that specific Scenario's column. These output tables are also downloaded as CSV files. Once the table has been downloaded and opened, the first step is to sort the rows of the table by habitat type, as shown

in Figure 7. This is because map unit scores will typically group fairly well by habitat type across most functions or services.

	C	E	N	O
1	MapUnitName	HabitatType	Nitrogen Storage (Percent Performance)	Total (Water) Nitrogen (Percent Performance)
2	Alewife7	Bare Ground (soil/rock)	0.062192842	0.06357741
3	Alewife10	Brush/Scrub-Shrub	0.514630735	0.27828756
4	Alewife11	Brush/Scrub-Shrub	0.178768635	0.155316621
5	Alewife4	Grassland/Herbaceous/Meado	0.150822252	0.07189976
6	Alewife6	Grassland/Herbaceous/Meado	0.181773365	0.131331936
7	Alewife3	Gravel Area: Trail, Road, Stagin	0.063171886	0.061483555
8	Alewife2	Landscaped Areas	0.174244985	0.174171537
9	Alewife	Mixed Forest/Grassland	0.07359025	0.065175176
10	Alewife9	Mixed Forest/Grassland	0.181773365	0.07616441
11	Alewife5	Pond	0.092035316	0.396108985
12	Alewife8	Stream/River (Perennial)	0.058808554	0.060032856

Figure 7. Example output map unit data where two map units with similar habitat types show scores that do not appear to be similar.

The column headers identify the function or service for which the scores are being presented. Once the rows have been sorted, scan through the scores in a given column[3] looking for groups of scores that show strong differences within the group or outliers in performance. An example of a potential outlier is outlined in red in Figure 7, where two map units with "Brush/Scrub-Shrub" habitat types show up with significantly different scores for Nitrogen Storage performance. These scores might indicate an error, and you should go back to the input data and examine the differences between the input attributes for the two map units. In the case of this example, further review of these two map units shows that the higher scoring map unit has significantly higher percentages of vegetative cover and thus performs at an appropriately higher level.

SITE-LEVEL DATA FOR A SCENARIO

After the map unit-level review has been completed, the final review takes place at the Scenario level. Outputs for this step are provided within the Project Workspace in the form of tables (visible or downloadable on the Tables sub-tab of the Reports tab) and charts (visible on the Charts sub-tab of the Reports tab). The data is normalized by area and summed to give you a better understanding of the changes that will occur across different Scenarios. Examining the data can help you determine whether trends in the performance of ecosystem services are consistent with your expectations for different Scenarios. For example, if you were comparing a Scenario for conserving a forest with a Scenario for developing the same area into an industrial site, you would expect all or most ecosystem services to perform higher in the conservation Scenario than in the development Scenario.

It is important to note that these elements of the ESII Tool provide summary data that is normalized by area. While they do provide a sense of the overall differences in performance between alternatives, large areas that perform at similar levels across Scenarios have a tendency to offset large magnitude changes

[3] Depending on the size of the project, and the intended usage of the tool, you may wish to automate, or semi-automate, the review process within a spreadsheet or other software package as a way to flag potential outliers for further review.

on smaller map units within a site. The interpretation of results is further discussed in the Results section of this User's Guide.

Site-Level vs. Map Unit-Level Scores

While the Site-level values in the summary tables on the Tables sub-tab are useful for Site-level comparisons, they are not suitable for map unit-level verification and validation because the map unit-level scores have been aggregated into area-weighted averages to support Site summary analysis.