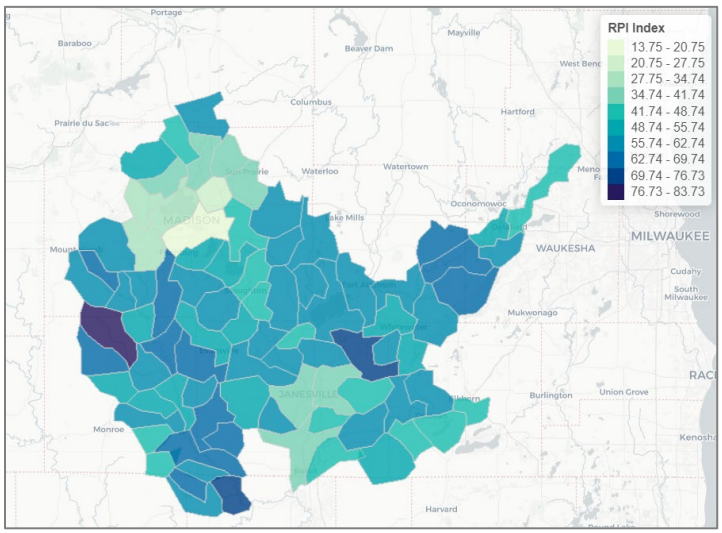
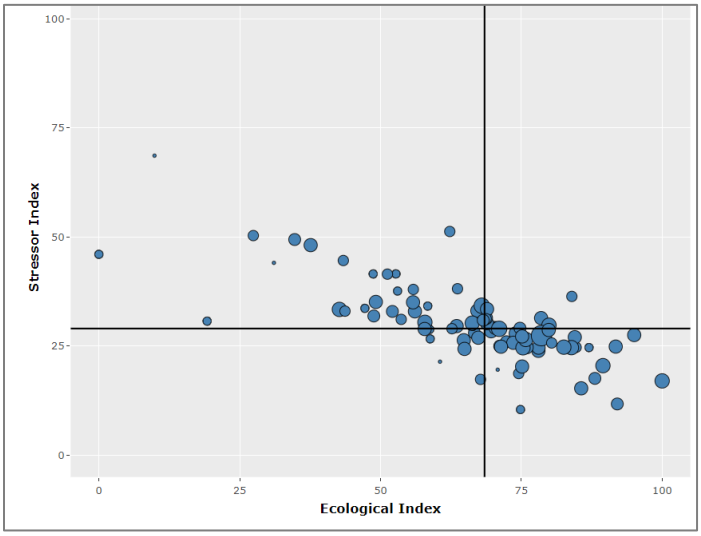
WEB RESTORATION AND PROTECTION SCREENING TOOL USER GUIDE





November 2024

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1. Introduction & Background

1.1. RPS Overview

Restoration and Protection Screening is a systematic method, tool and database that was developed by the U.S. Environmental Protection Agency to support strategic planning of priority waters and watersheds. RPS provides states and other planners with a flexible screening tool to guide prioritization of watersheds so that available resources can be focused on areas with the highest needs or where the greatest benefits are likely to occur.

RPS involves identifying a group of watersheds to be compared and a specific purpose for comparison; selecting appropriate indicators in three categories (Ecological, Stressor and Social; Figure 1); and calculating index scores for the subwatersheds which summarize indicator data. Index scores include the Ecological Index, Stressor Index and Social Index. Index scores are calculated by combining indicators from each category. For example, the Ecological Index is calculated from all ecological indicators, while the Stressor Index is calculated from all stressor indicators. In addition, an overall Restoration and Protection Integrated, or RPI, index score is calculated by combining the Ecological Index, Stressor Index and Social Index.

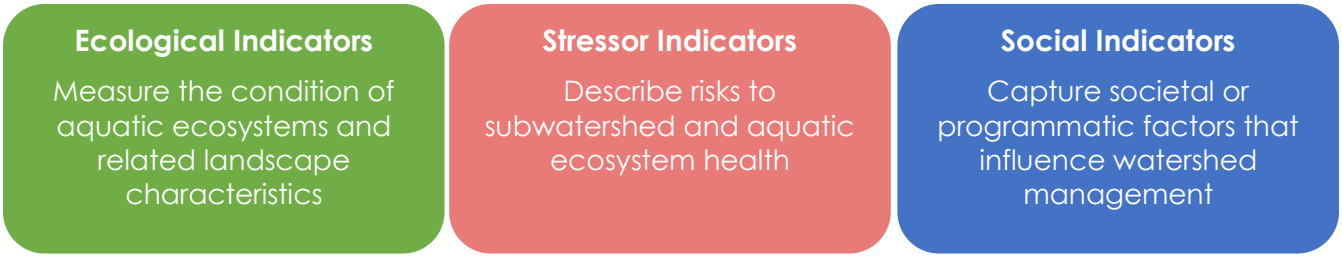


Figure 1. RPS uses three categories of indicators to compare subwatersheds.

1.2. Web RPS Tool

The Web RPS Tool is an online application that enables users to explore indicator data, set up a screening to compare HUC12 subwatersheds and view screening results. The Web RPS Tool:

- Provides access to the data in the RPS Indicator Database, which includes measurements of ecological, stressor and social characteristics compiled for roughly 83,000 HUC12 subwatersheds across the conterminous United States.
- Contains a user-friendly interface for exploring indicator data and setting up a screening.
- Automatically calculates RPS index scores and ranks for the screened HUC12 subwatersheds.
- Displays screening results in customizable table, plot and map form.
- Can be readily updated with user-generated custom indicator data.

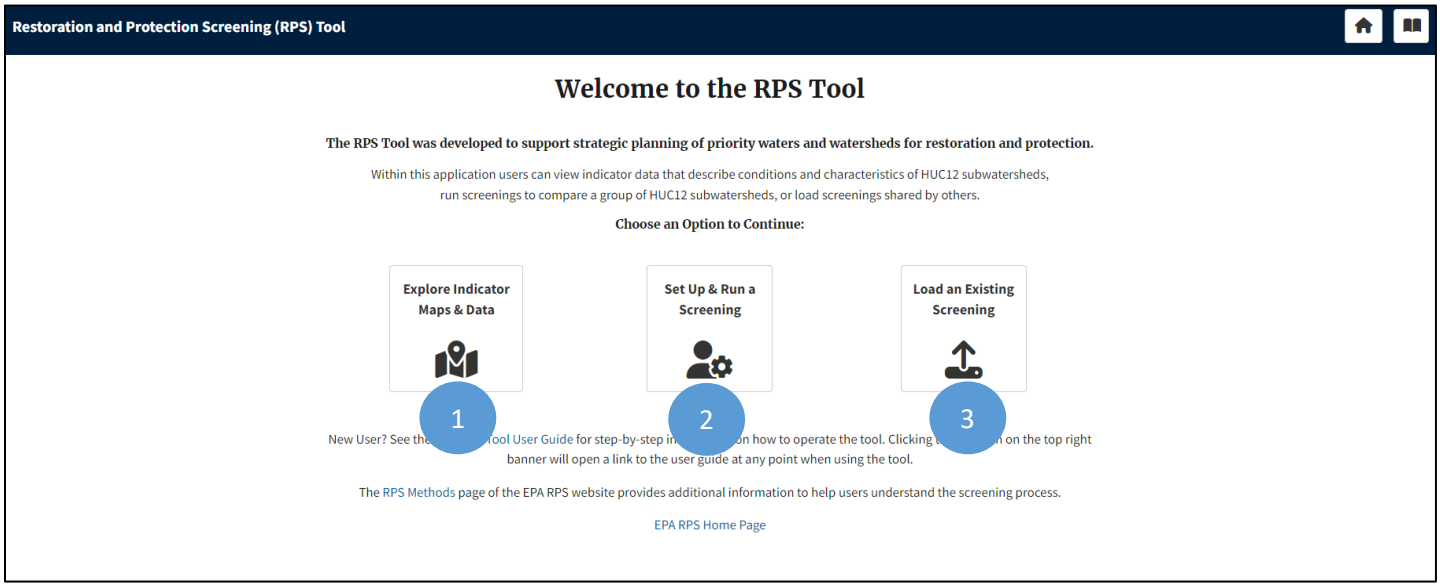
This User Guide provides detailed, step-by-step directions on how to operate the Web RPS Tool. A description of the screening process, and information to help interpret the results of a screening, are provided on the RPS Methods page of the EPA RPS website.

The Web RPS Tool only requires a web browser to run, such as Microsoft Edge or Google Chrome. No additional software or files are needed.

The Web RPS Tool can be accessed at: https://www.epa.gov/rps/web-rps-tool

2. Landing Page

The ***Landing Page*** is the first screen that is displayed in your browser after loading the Web RPS Tool.



From the landing page, users can choose to click one of three buttons:

1. Clicking the **Explore Indicator Maps & Data** button will allow users to view maps and charts of indicator data for HUC12 subwatersheds in any area of interest. Indicator data for the area of interest can also be downloaded. This option is intended for:
   - Users that are interested in exploring indicator data, but do not want to run a screening to compare HUC12s.
   - Users that are planning to run a screening to compare HUC12s, but first want to gain a better understanding of available indicators.
   - Users that want to download indicator data for all HUC12s in a state, basin or other area of interest.

   In this guide, Section 3 *(Explore Indicator Maps & Data)* provides step-by-step instructions for using the indicator data explorer.

2. Clicking the **Set Up & Run a Screening** button will direct users to a series of tabs to set up a screening to compare HUC12 subwatersheds and view the screening results. The screening results can also be downloaded.

   In this guide, Section 4 (*Set Up & Run a* Screening) provides step-by-step instructions for setting up a screening and viewing results.

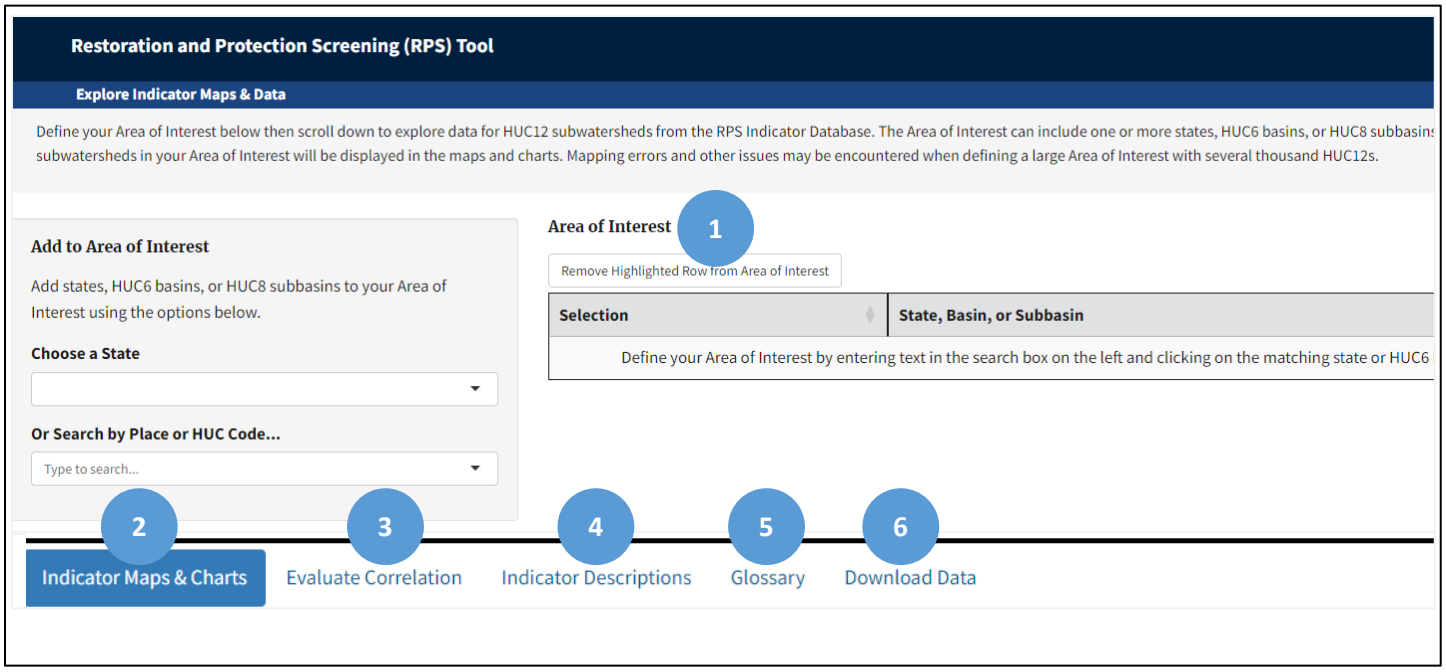
3. Clicking the **Load an Existing Screening** button will open a menu for loading a saved screening file. This option is intended for users who would like to load a screening file they previously saved or load a screening file that was shared by others.

   In this guide, Section 5 (*Load an Existing Screening*) provides step-by-step instructions for loading a saved screening.

3. Explore Indicator Maps & Data

3.1. Overview

The ***Explore Indicator Maps & Data*** page of the Web RPS Tool contains features for users to learn more about the indicator data available in the tool. These features can help beginner users who are planning to run a screening with identifying which indicators to include in their screening. The page can also be used to complete basic evaluations of conditions in one or more HUC12s using maps and charts that display indicator data.



The page consists of the ***Area of Interest*** section and five tabs for exploring indicator data. These are summarized below and described in detail in the following sections:

1. In the ***Area of Interest*** section, you will specify the geographic area containing the HUC12s that you would like to explore.

2. On the ***Indicator Maps and Charts*** tab, you can view and customize maps of indicator data for HUC12s in your area of interest. The tab also contains charts and tables that display the statistical distribution of indicator values in your area of interest.

3. On the ***Evaluate Correlation*** tab, you can explore the correlation between pairs of indicators within your area of interest.

4. The ***Indicator Info*** tab contains a searchable table with descriptions of all available HUC12 indicators in the RPS Indicator Database.

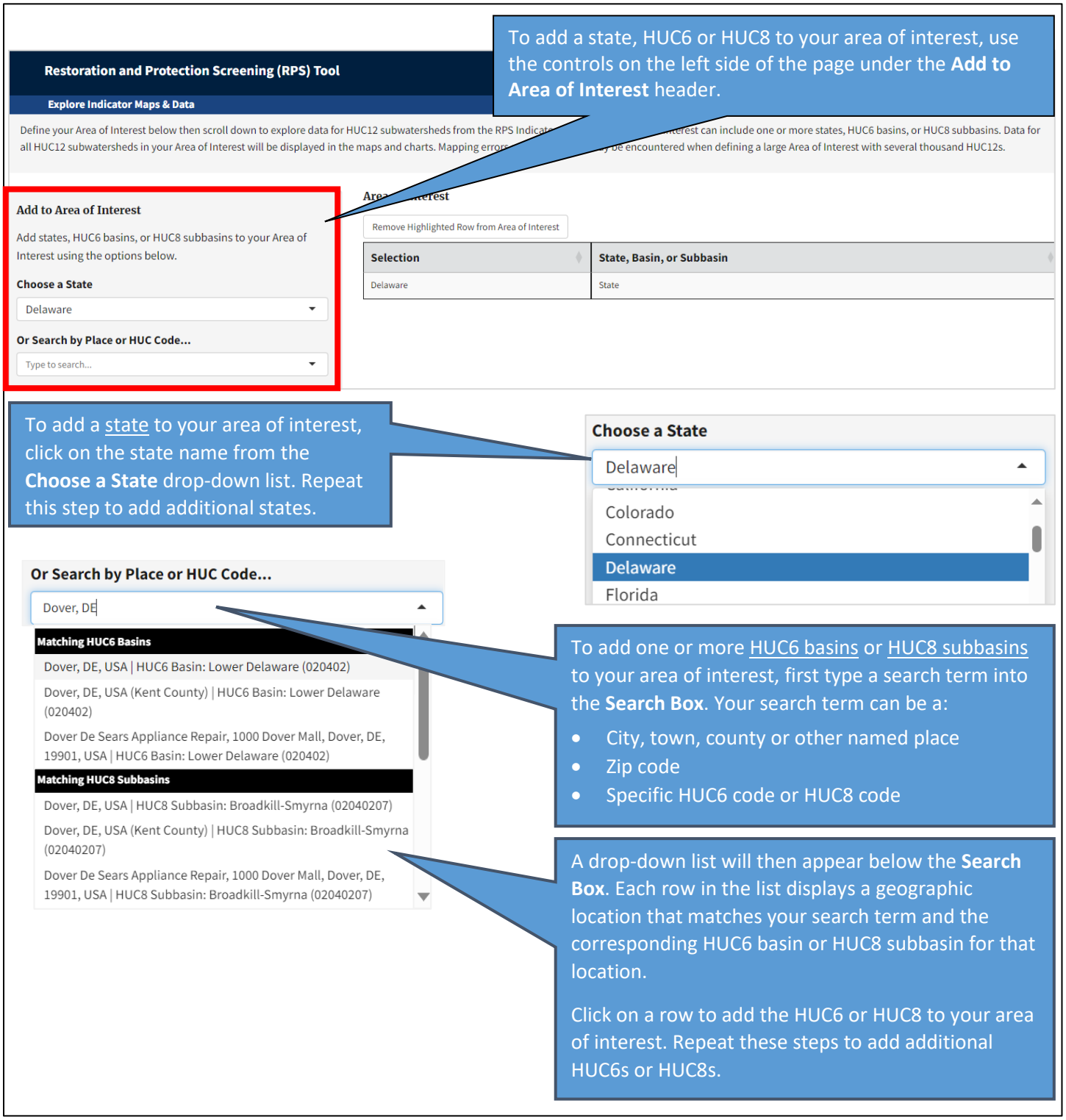
5. The ***Glossary*** tab lists the definitions of glossary terms used in indicator descriptions.

6. On the ***Download Data*** tab, you can download a file with data for all indicators in the RPS Indicator Database for HUC12s in your area of interest.

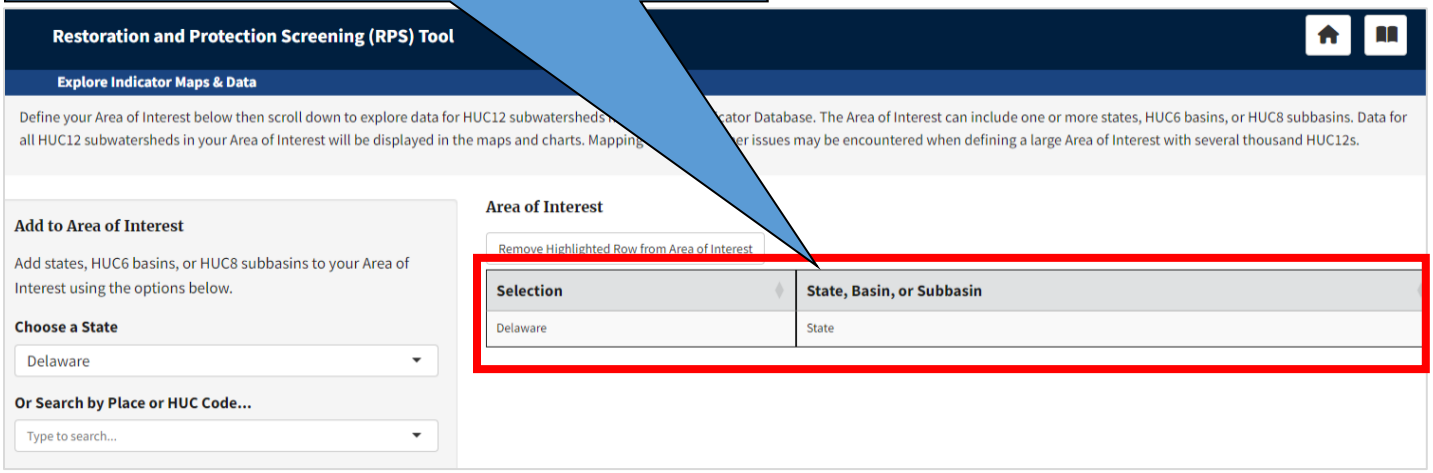
3.2. Area of Interest

The ***Area of Interest*** section of the ***Explore Indicator Maps & Data*** page contains interactive controls for defining the geographic area that you would like to explore. An area of interest can include one or more states, HUC6 basins or HUC8 subbasins. Indicator data for all HUC12s in the selected area of interest will be retrieved and loaded into the tool.

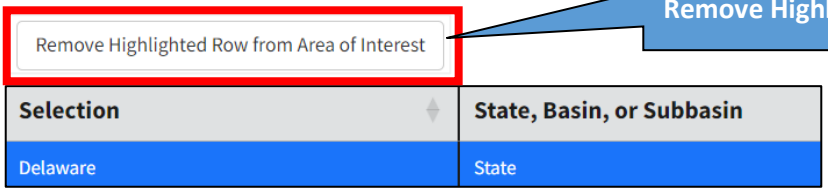
Your area of interest can be adjusted at any time when using the ***Explore Indicator Maps & Data*** page by following the steps described below to add or remove states, HUC6s or HUC8s.



The states, HUC6s and HUC8s that are added to your area of interest will be listed in the table on the right side of the page under the **Area of Interest** header.

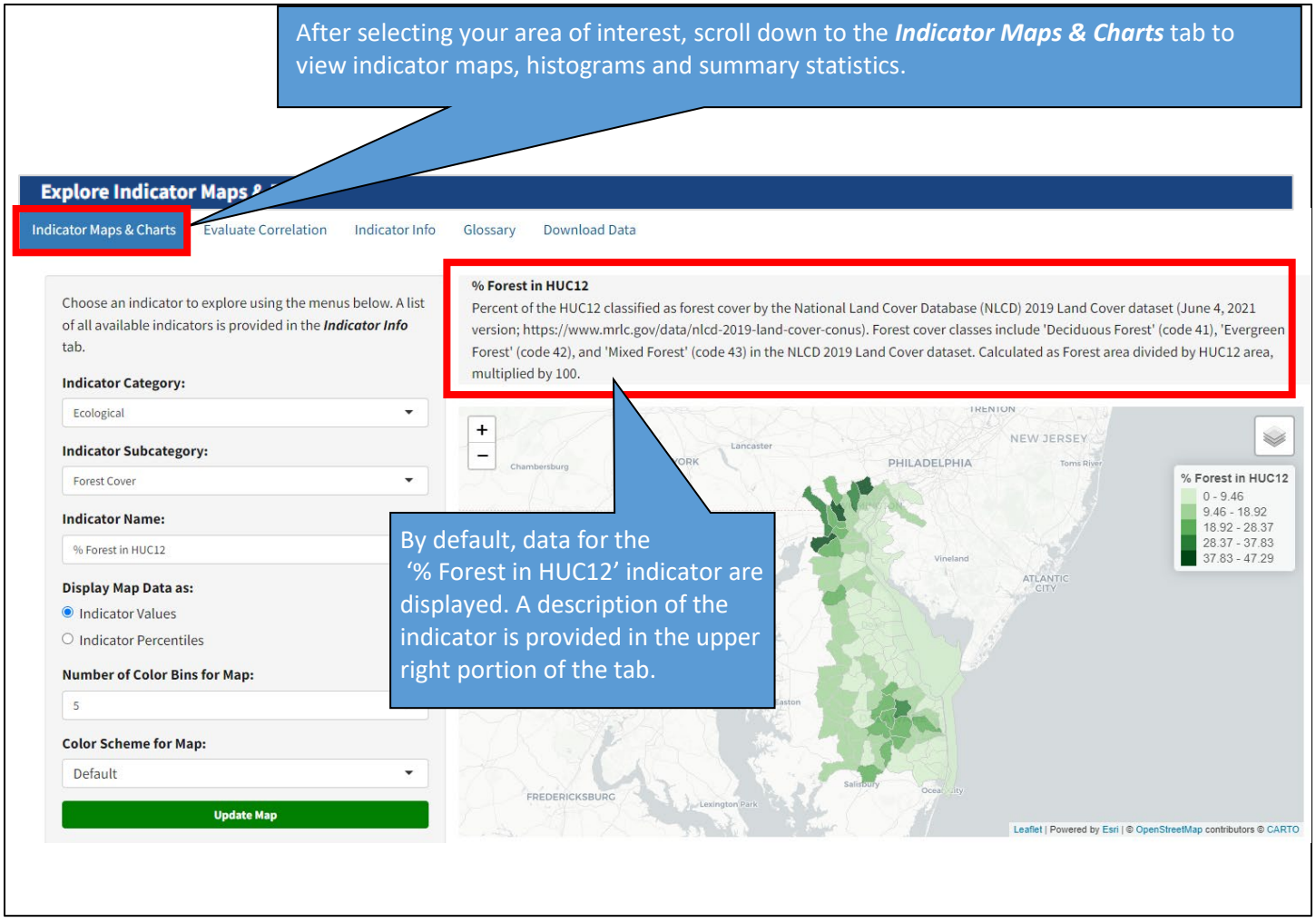


A state, HUC6 or HUC8 can be removed from your area of interest by highlighting its row in the table and clicking the **Remove Highlighted Row from Area of Interest** button.

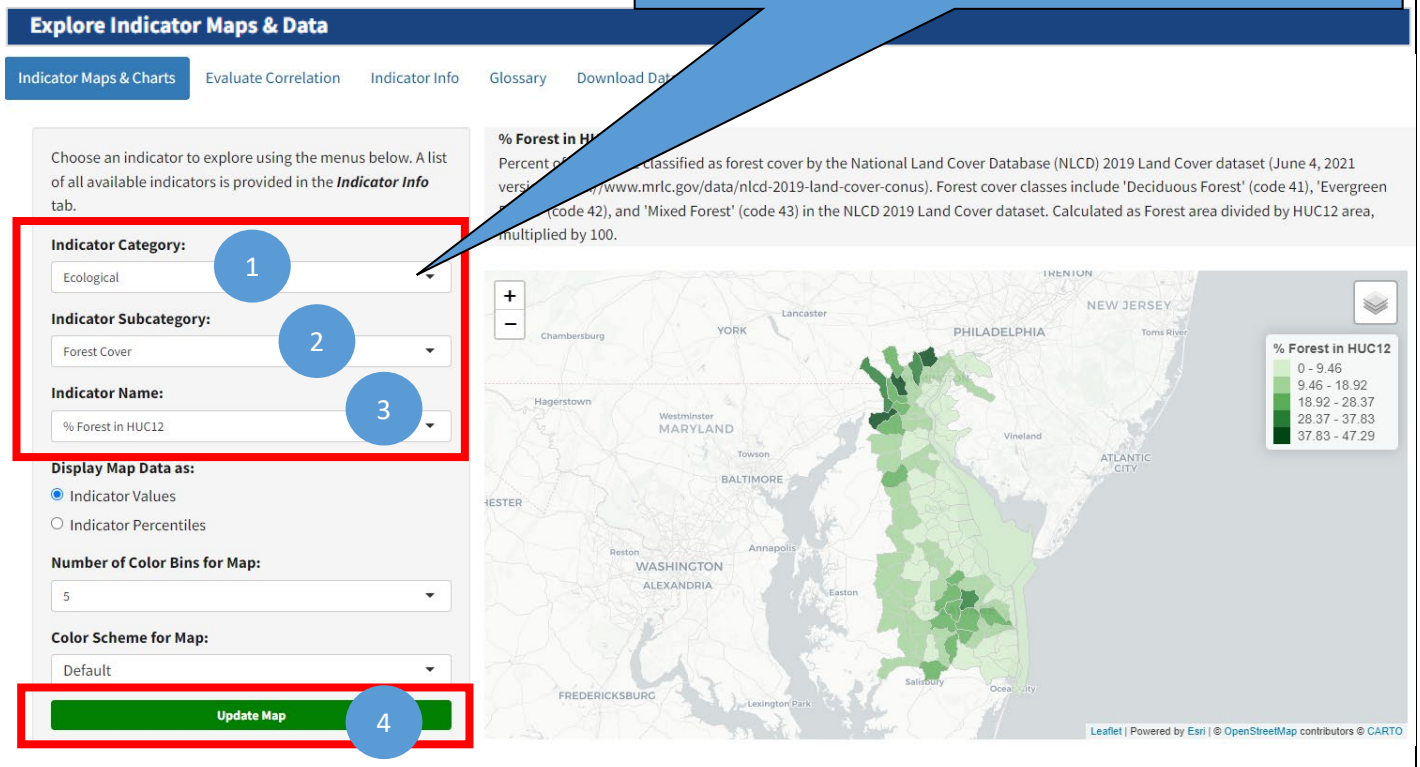


3.3. Indicator Maps & Charts

The ***Indicator Maps & Charts*** tab on the ***Explore Indicator Maps & Data*** page contains a customizable map of indicator data for your area of interest. The tab also displays a histogram and summary statistics table to help understand the statistical distribution of indicator data in the area of interest.



3.3.1. Select a Different Indicator to Explore



1. First choose a category from the **Indicator Category** drop-down list, either 'Base', 'Ecological', 'Stressor' or 'Social'.

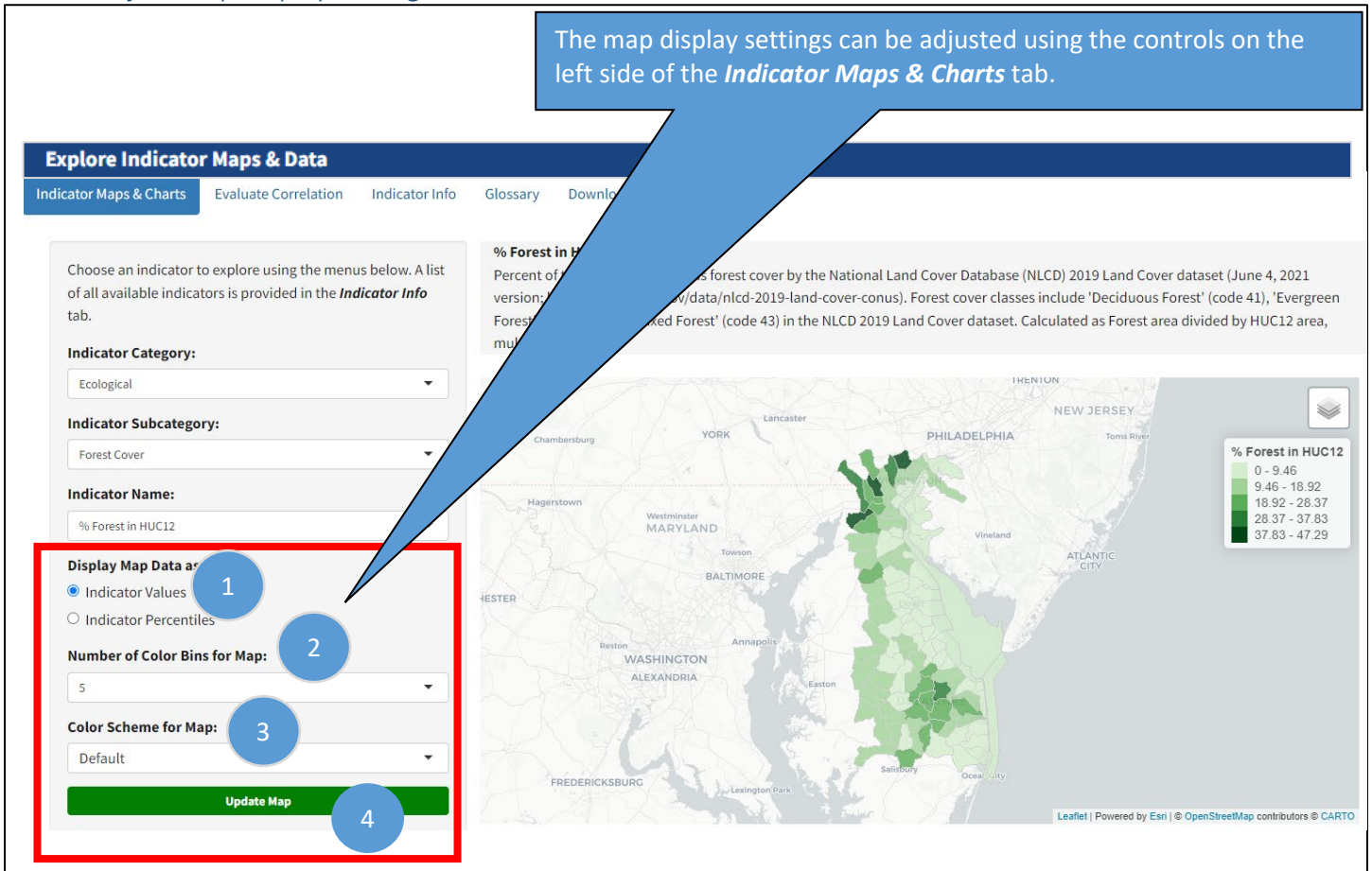
2. Next, choose an option from the **Indicator Subcategory** drop-down list. The subcategories shown in the list will depend on the category selected.

3. Then choose the name of the indicator that you would like to display from the **Indicator Name** drop-down list. The indicators shown in the list will depend on the category and subcategory

4. The indicator description, histogram and summary statistics table will automatically update to reflect the indicator that you select from the **Indicator Name** drop-down list.

   However, you must click the **Update Map button** to refresh the map with the selected indicator.

3.3.2. Adjust Map Display Settings



1 Use the **Display Map Data as** option buttons to choose how indicator data are reported on the map.

- The **Indicator Values** option will display raw values of the selected indicator.
- The **Indicator Percentiles** option will display the percentile rank of each HUC12. For example, a HUC12 with a percentile rank of 90 means that the HUC12 has an indicator value which is greater than 90% of all other HUC12s in the area of interest.

2 Use the **Number of Color Bins for Map** drop-down list to choose how many different colors are displayed on the map. Up to 10 color bins can be selected.

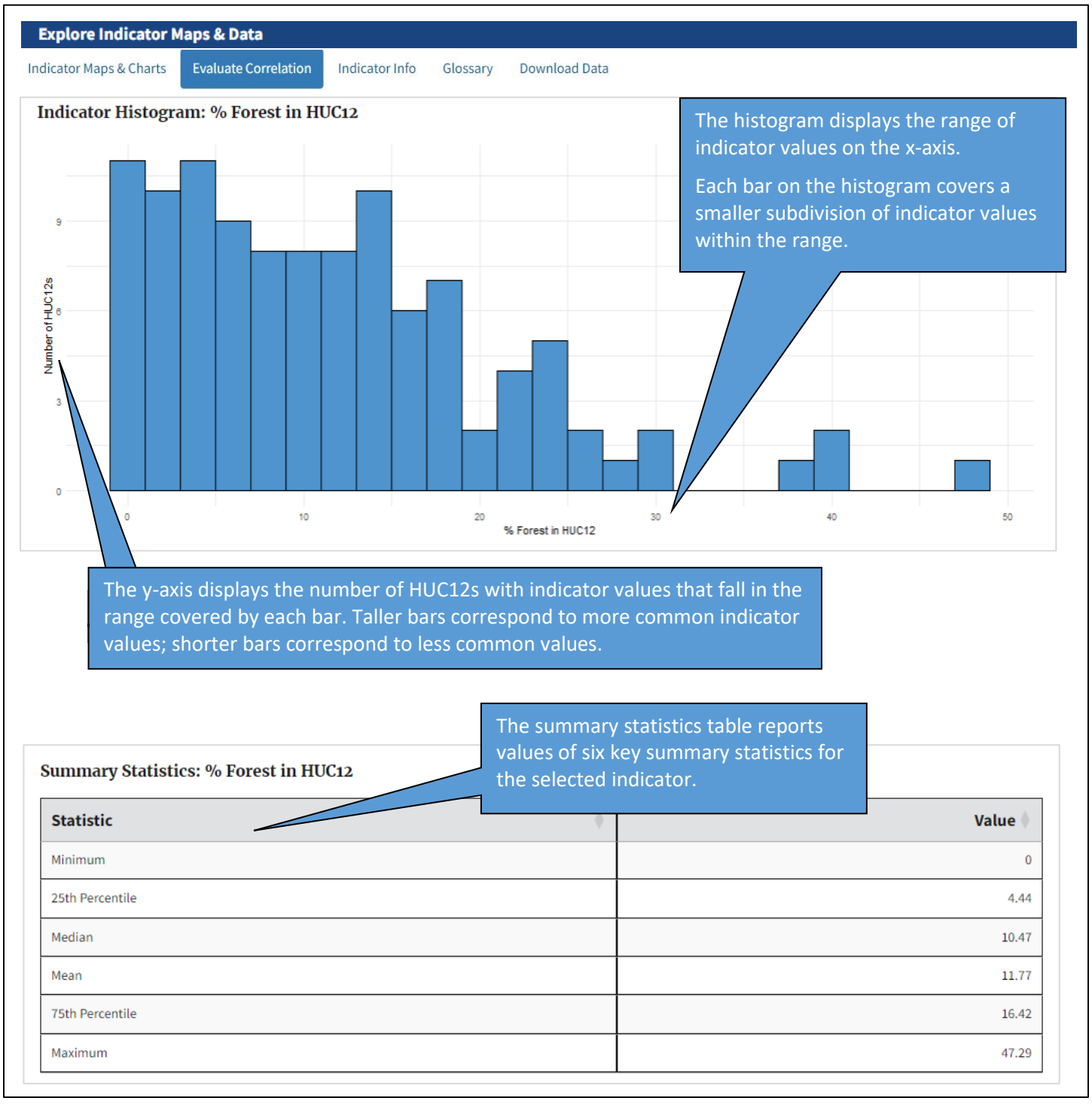
3 Use the **Color Scheme for Map** drop-down list to choose a between a green, red or blue color scheme. By default, Ecological indicators are shaded green, Stressor indicators are red and Social indicators are blue.

4 You must click the **Update Map button** to refresh the map with the new display settings.

3.3.3. View Histogram and Summary Statistics

In the ***Indicator Maps & Charts*** tab on the ***Explore Indicator Maps & Data*** page, scroll below the map to view a histogram and summary statistics table for the selected indicator. The histogram and table describe the statistical distribution of indicator values within your area of interest. If multiple states, HUC6s or HUC8s are included in your area of interest, then then histogram and summary statistics are calculated across all HUC12s in the area of interest.

The distribution of indicator values can inform decisions on whether to include an indicator in a screening. For example, indicators that cover a very small range of values may not convey meaningful differences between HUC12s, while indicators with extreme outliers may skew the screening results. The RPS Methods page of the EPA RPS website provides additional information on understanding and interpreting statistical distributions.

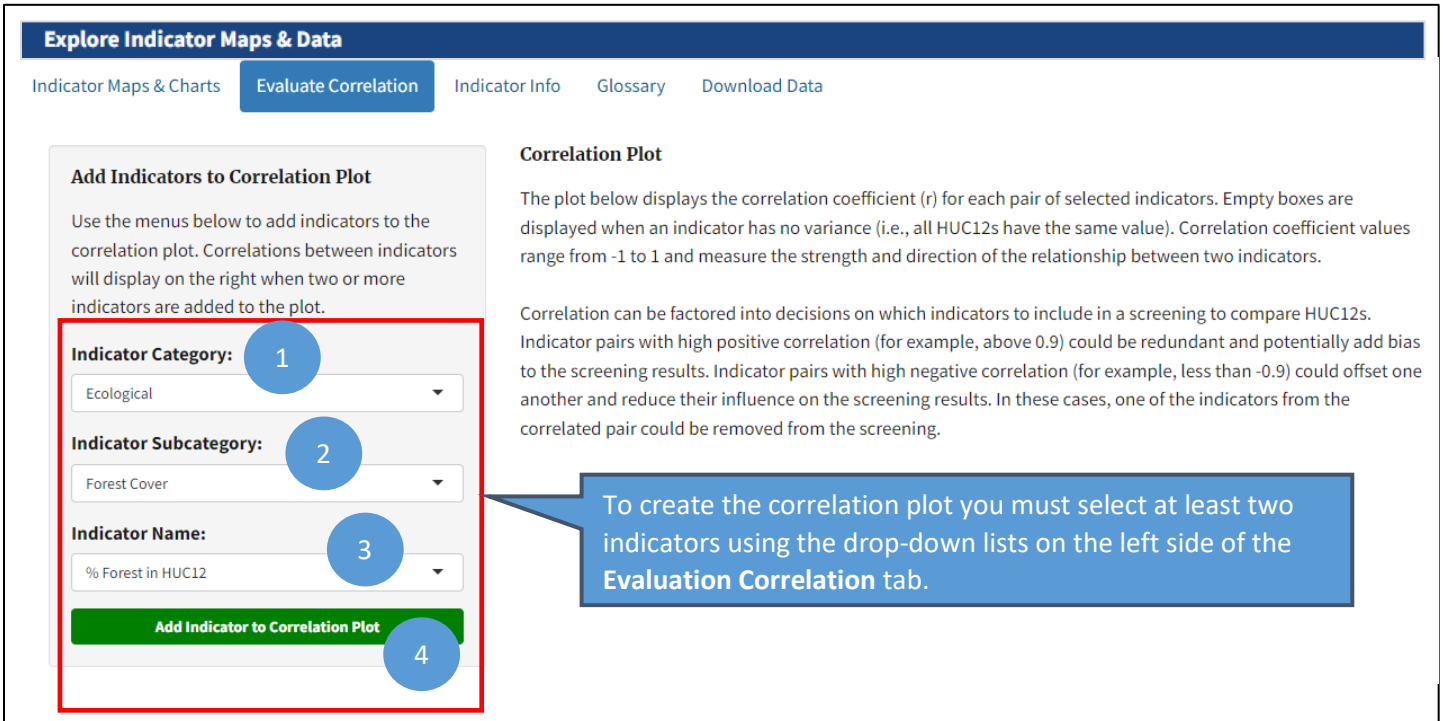


3.4. Evaluate Correlation

The ***Evaluate Correlation*** tab on the ***Explore Indicator Maps & Data*** page allows users to explore correlation between pairs of indicators within the area of interest. The tab displays a plot with the Pearson correlation coefficient (r) reported for each pair of indicators selected by the user.

Correlations can be factored into decisions about which indicators to include in a screening. Indicator pairs with high positive correlation (for example, above 0.9) could be redundant and potentially add bias to the screening results. Indicator pairs with high negative correlation (for example, less than -0.9) could offset one another and reduce their influence on the screening results. In these cases, one of the indicators from the correlated pair could be omitted from a screening.

3.4.1. Add Indicators to Correlation Plot



1. First choose a category from the **Indicator Category** drop-down list, either 'Base', 'Ecological', 'Stressor' or 'Social'.
2. Next, choose an option from the **Indicator Subcategory** drop-down list. The subcategories shown in the list will depend on the category selected.
3. Then choose the name of the indicator that you would like to display from the **Indicator Name** drop-down list. The indicators shown in the list will depend on the category and subcategory selected.
4. Click the **Add Indicator to Correlation Plot button** to refresh the correlation plot with the selected indicator.

3.4.2. View Correlation Plot

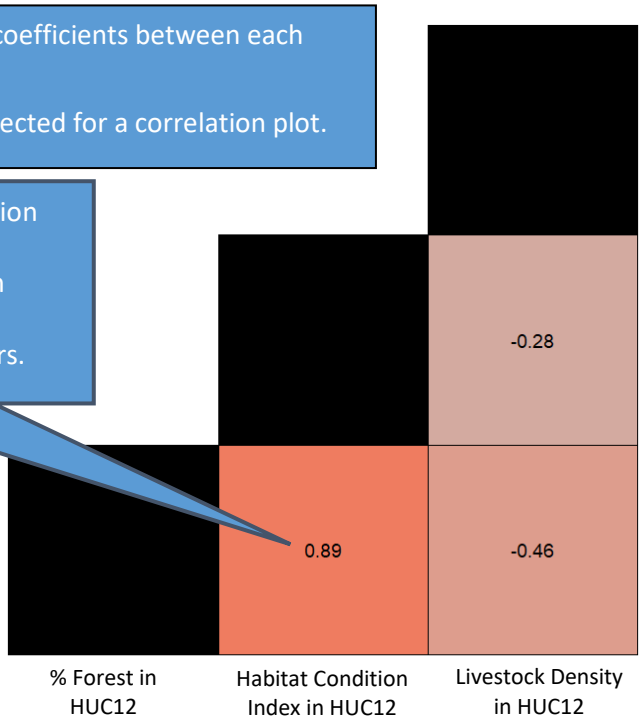
Explore Indicator Maps & Data

Indicator Maps & Charts | Evaluate Correlation | Indicator Info | Glossary | Download Data

The correlation plot displays correlation coefficients between each pair of user-selected indicators.

In this example, three indicators were selected for a correlation plot.

Each box in the plot contains the correlation coefficient for one pair of indicators. For example, this box displays the correlation between the 'Habitat Condition Index in HUC12' and '% Forest in HUC12' indicators.



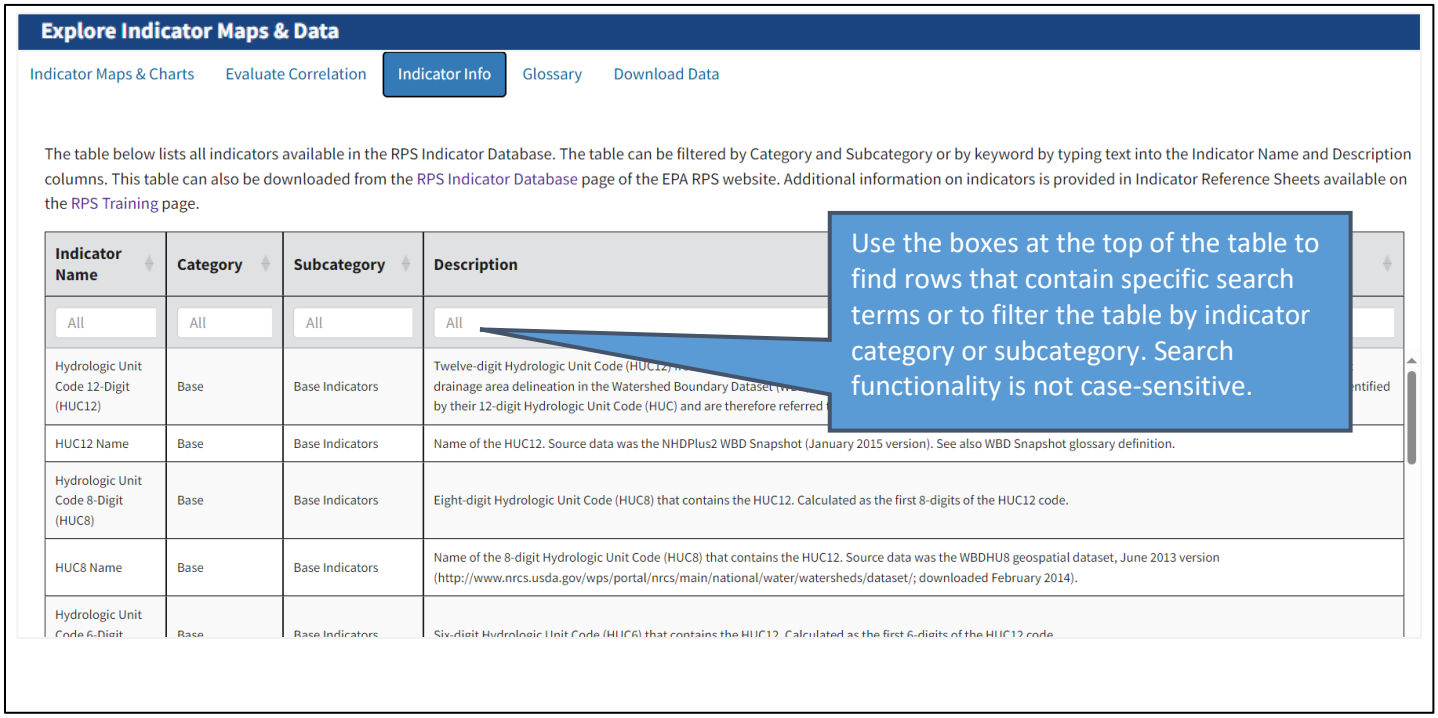
To remove an indicator from a correlation plot, highlight the indicator in the table below the plot. Then click the **Remove Highlighted Indicator from Correlation Plot** button.

Remove Highlighted Indicator From Correlation Plot

Indicator Name	Category	Subcategory
% Forest in HUC12	Ecological	Forest Cover
Habitat Condition Index in HUC12	Ecological	Aquatic Life and Habitat
Livestock Density in HUC12	Stressor	Livestock

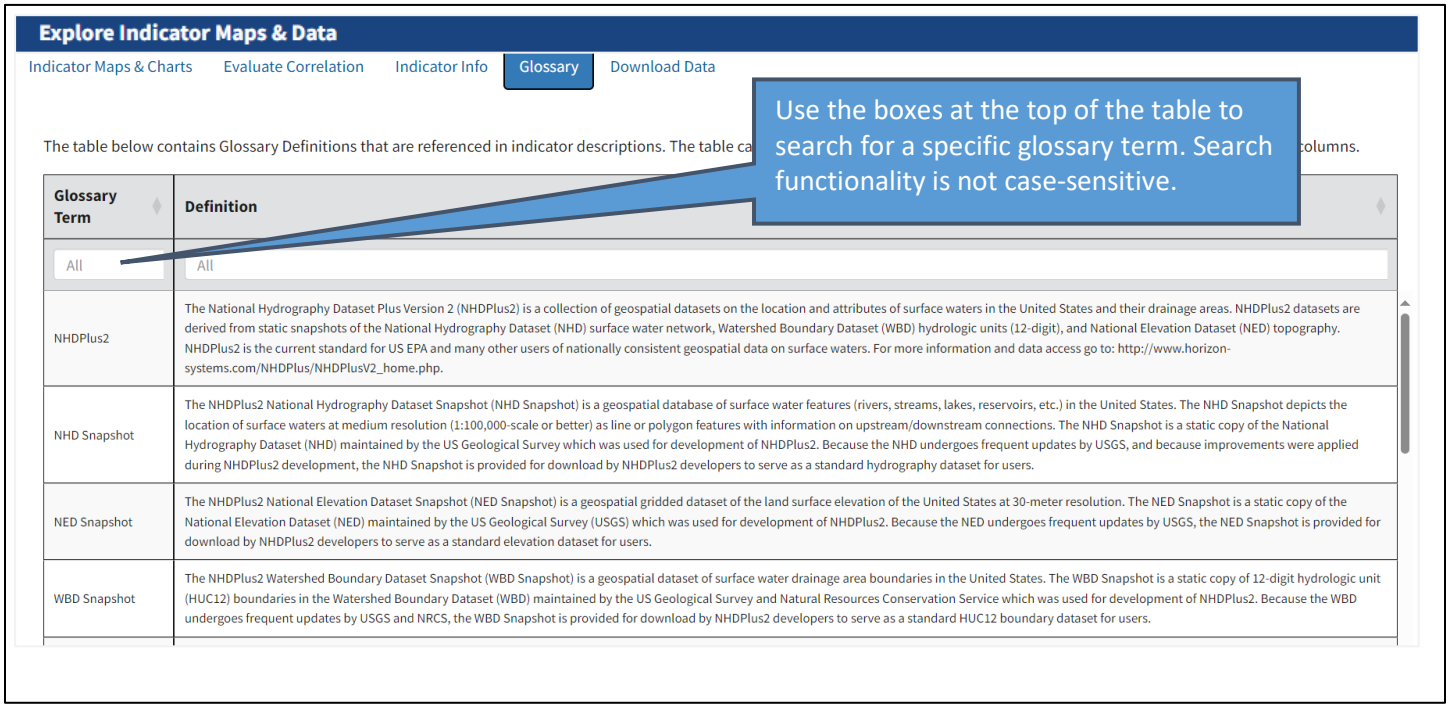
3.5. Indicator Info

The ***Indicator Info*** tab on the ***Explore Indicator Maps & Data*** page contains a table with descriptions of all indicators available in the RPS Indicator Database. The table can be searched, filtered and sorted. Users do not have to define an area of interest before viewing the ***Indicator Info*** tab.



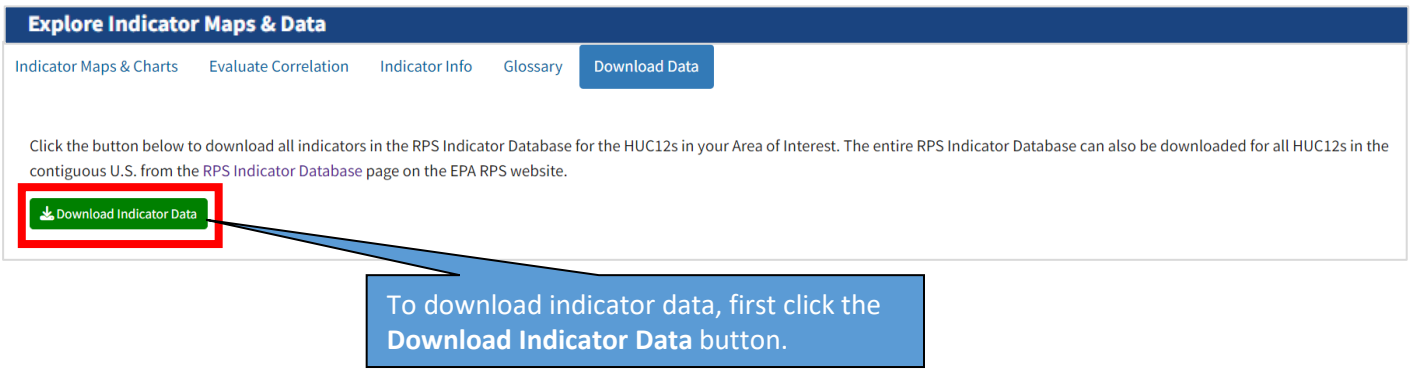
3.6. Glossary

The ***Glossary*** tab on the ***Explore Indicator Maps & Data*** page contains definitions for glossary terms used in the ***Indicator Info*** tab. The table can be searched, filtered and sorted. Users do not have to define an area of interest before viewing the ***Glossary*** tab.



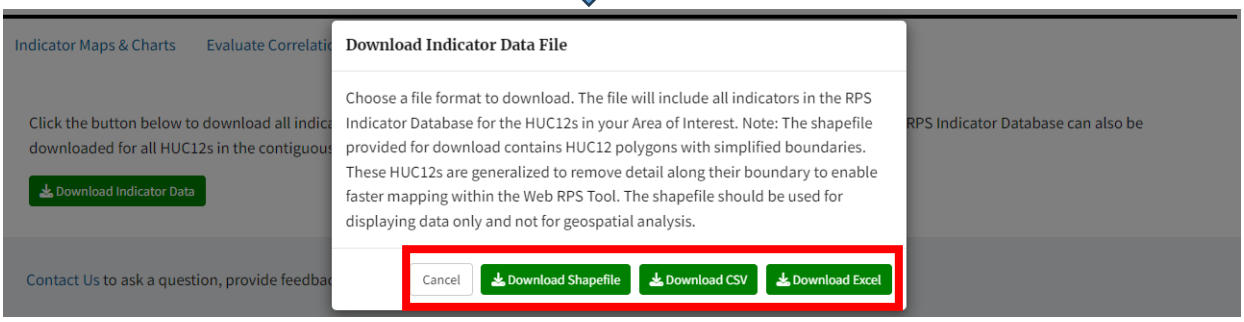
3.7. Download Data

The ***Download Data*** tab on the ***Explore Indicator Maps & Data*** page enables users to download indicator data for all HUC12s in the area of interest. Indicator data can be downloaded in shapefile, Microsoft Excel or comma-separated text file format. The downloaded files include data for all indicators in the RPS Indicator Database. Users must define an area of interest before downloading data.



To download indicator data, first click the **Download Indicator Data** button.

A popup window will appear. Select the desired file format: shapefile, comma-delimited text (CSV) or Microsoft Excel.



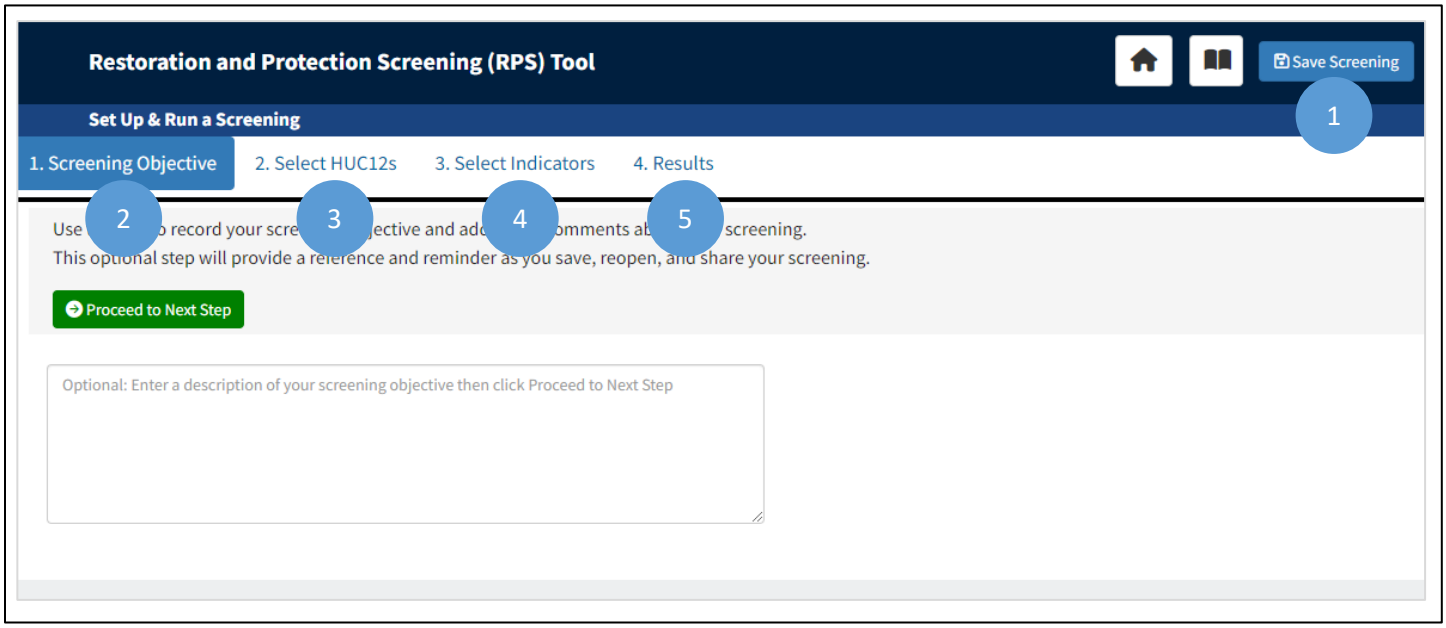
A compressed (.zip) file will be downloaded to your computer that contains the data in your selected format. The file will be stored in your web browser's default directory for file downloads. The filename will begin with 'rps-explore' and will include the file format and download date.

4. Set Up & Run a Screening

4.1. Overview

The ***Set Up & Run Screening*** page of the Web RPS Tool contains features for users to configure a screening to compare HUC12 subwatersheds, view and understand the screening results, and download the screening data.

Before using the ***Set Up & Run Screening*** page, users should already have identified their screening objective, their geographic area of interest to screen and a group of potential indicators to include in their screening. Additional information to support these steps is provided on the RPS Methods page of the EPA RPS website.



The ***Set Up & Run Screening*** page includes four tabs for configuring a screening and viewing results and a button for saving your progress. These are summarized below and described in detail in the following sections:

1. The **Save Screening** button is used to save a snapshot of your screening progress by downloading a file that stores all the information entered and selected on each tab.

2. On the ***Screening Objective*** tab, you can record your screening objective and additional comments about your screening. This optional step will provide a reference and reminder as you save, reopen and share your screening.

3. On the ***Select HUC12s*** tab you will choose which HUC12 subwatersheds to include in your screening.

4. On the ***Select Indicators*** tab you will choose the group of indicators to include in your screening. You can also upload your own custom indicators to use in the screening.

5. On the ***Results*** tab you will create and view maps and plots that display your screening results. You can also download a file containing your screening's indicator data and results.

The four tabs on the ***Set Up & Run Screening*** page should be completed sequentially. Users must click the **Proceed to Next Step** button to go to the next tab.

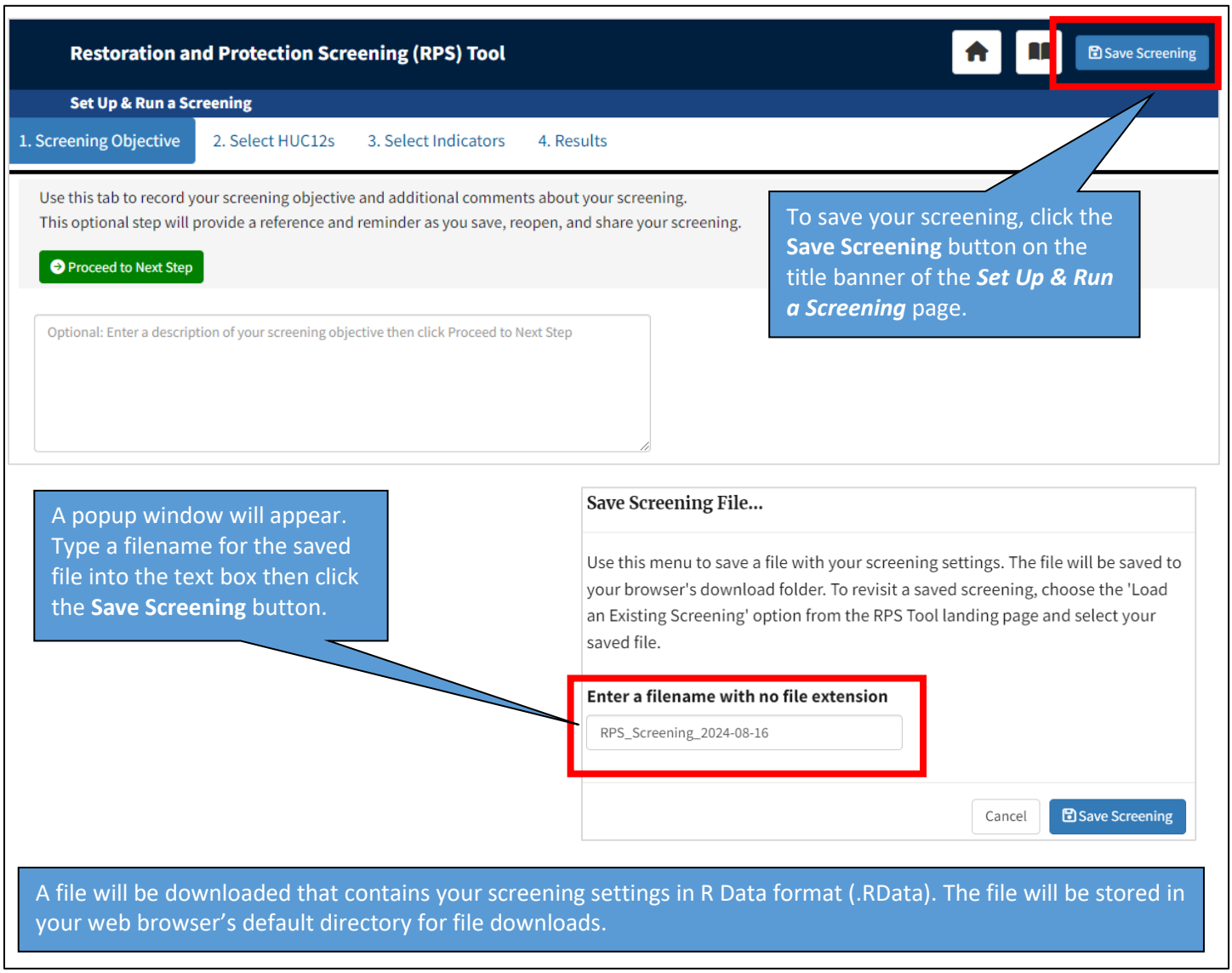
4.2. Save Screening

The **Save Screening** button is located on the title banner of the ***Set Up & Run a Screening*** page. Clicking the button will save a snapshot of your screening progress by downloading a file that stores all the information entered and selected on each tab. For example, the saved file will store notes entered on the screening objective tab, the HUC12s selected for the screening, the indicators selected for the screening and indicator settings. You can save your screening at any point on the ***Set Up & Run a Screening*** page.

Saved screenings can be loaded into the tool at a later time. See Section 6 (*Load an Existing Screening*) of this guide for instructions on how to load a saved screening. Users may decide to save their screening to:

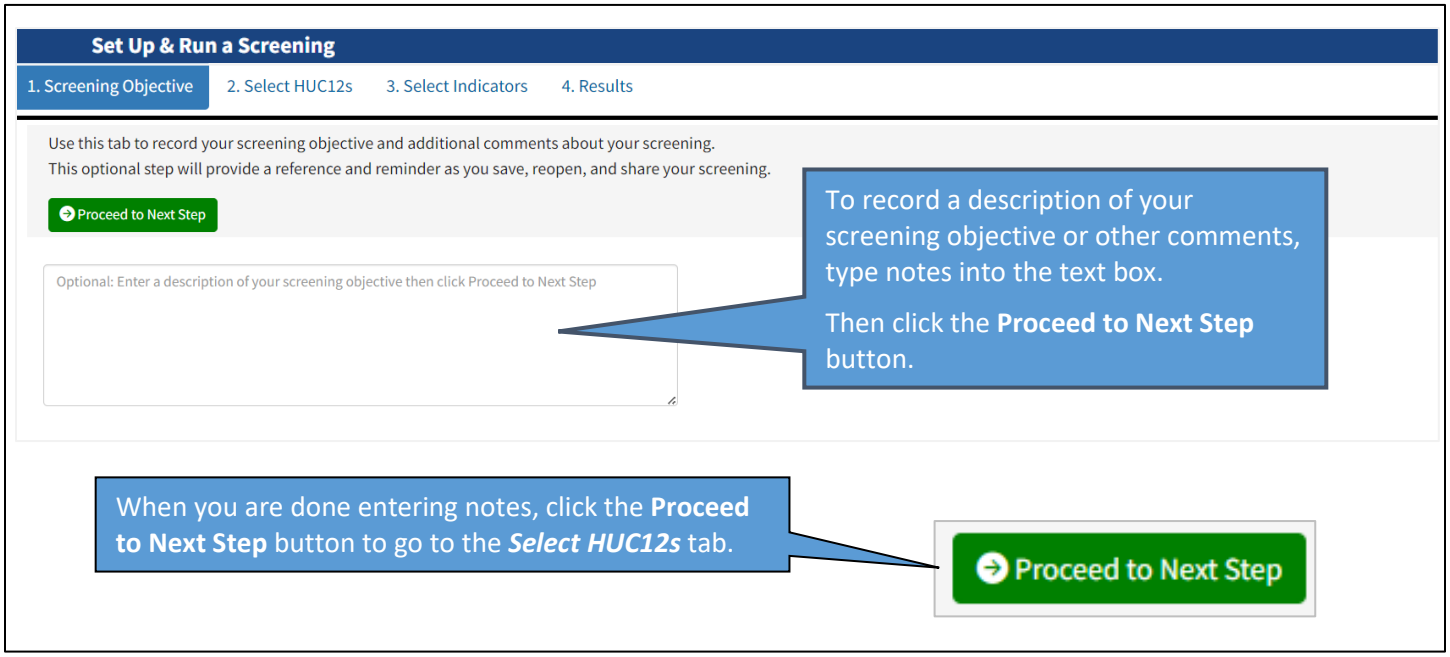
- Continue working on a partially completed screening at a later time.
- Review the results of an existing screening.
- Adjust the settings of an existing screening.
- Share their screening with others.

Note that the title banner of the ***Set Up & Run a Screening*** page also contains the **Home** button. Clicking the **Home** button will restart the application and return the user to the ***Landing Page***. Any unsaved changes will be lost unless you first click the **Save Screening** button.



4.3. Screening Objective

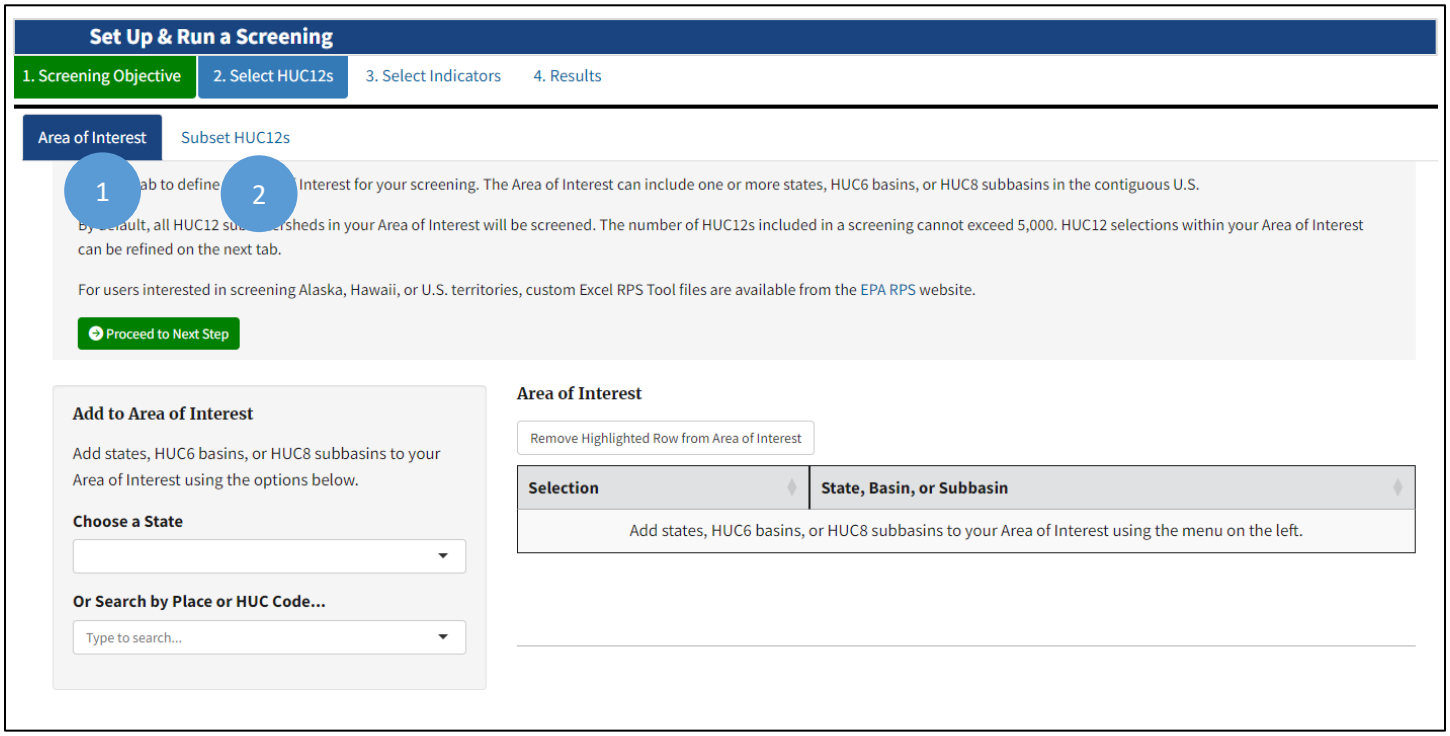
The ***Screening Objective*** tab on the ***Set Up & Run a Screening*** page contains a text box for recording notes on your screening objective and additional comments about your screening. This optional step provides a reference and reminder as you save, reopen and share your screening.



4.4. Select HUC12s

4.4.1. Overview

The ***Select HUC12s*** tab on the ***Set Up & Run a Screening*** page contains controls for choosing HUC12s to include in your screening. Note that the number of HUC12s included in a screening cannot exceed 5,000. If you would like to screen a larger area, contact the EPA RPS Team at hwp-team@epa.gov.



The ***Select HUC12s*** tab contains two subtabs:

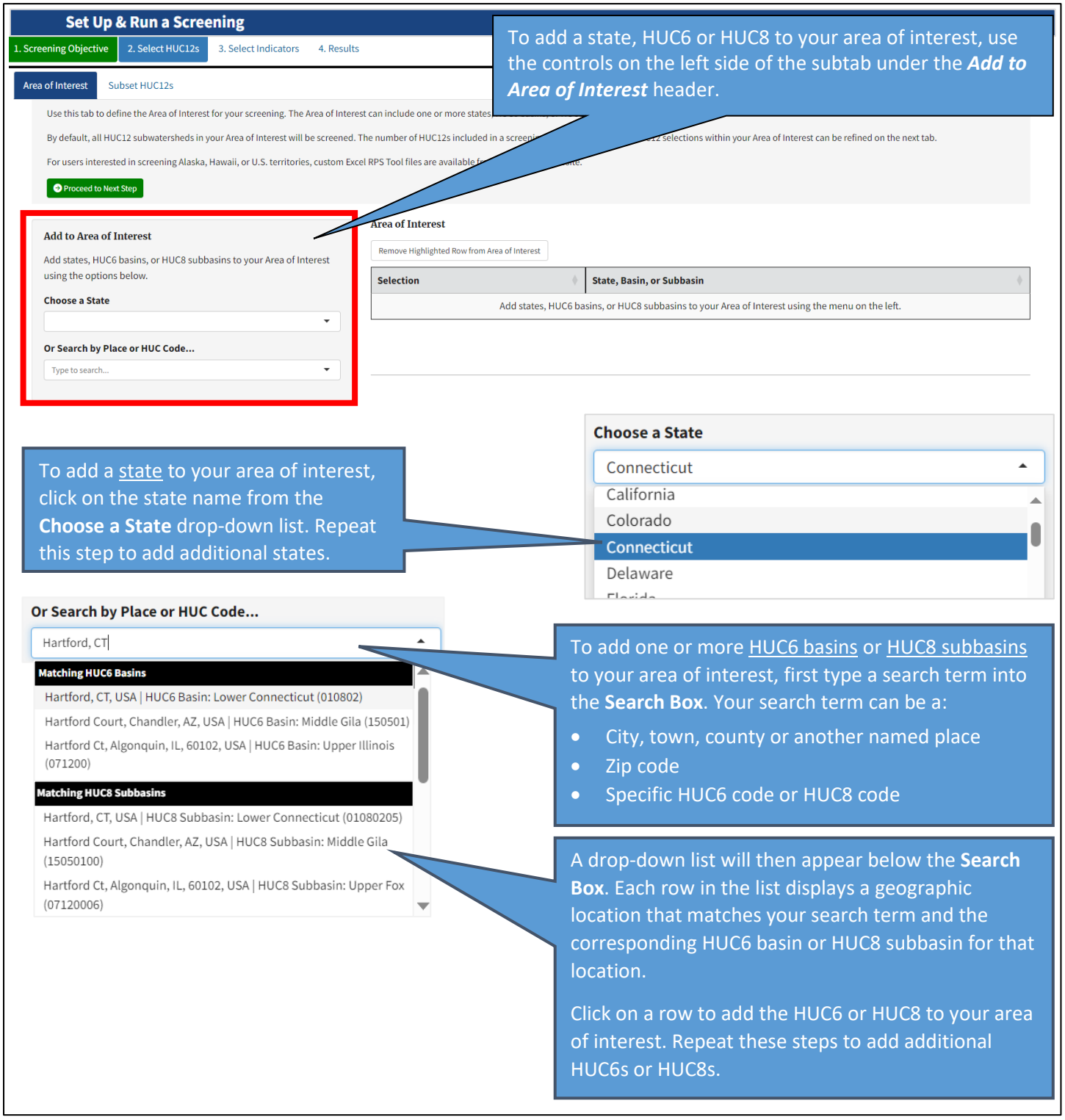
1. On the ***Area of Interest*** subtab, you will define the geographic area which contains the HUC12s that you would like to screen. An area of interest can include one or more states, HUC6 basins or HUC8 subbasins.

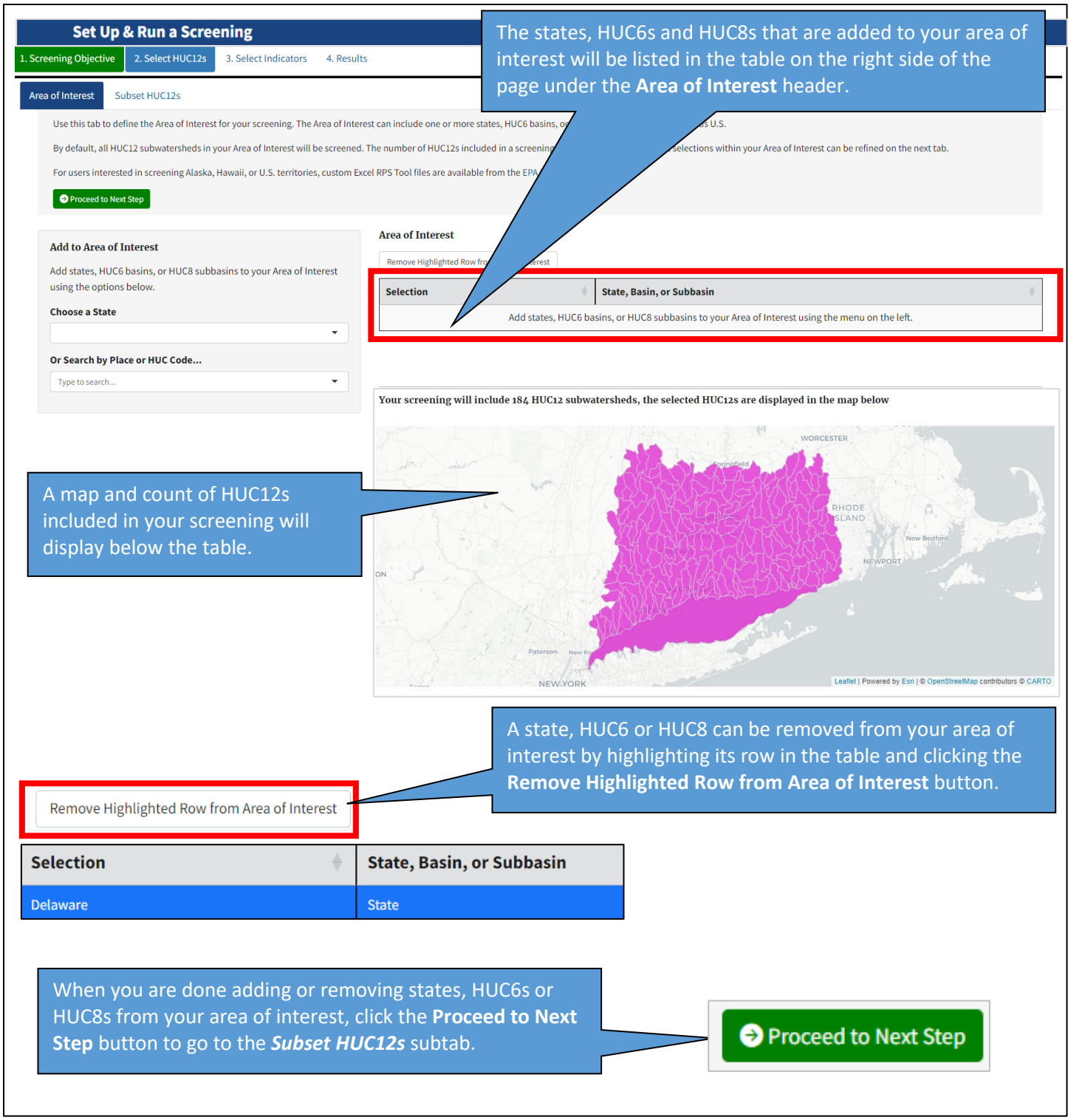
2. On the ***Subset HUC12s*** subtab you can define filters to select a smaller subset of HUC12s from your area of interest. Filters can use any indicator in the RPS Indicator Database and can reflect factors such as administrative boundaries (i.e. county), land cover or impaired waters presence/absence.

4.4.2. Area of Interest

The ***Area of Interest*** subtab contains interactive controls to define the geographic area which contains the HUC12s that you would like to screen. An area of interest can include one or more states, HUC6 basins or HUC8 subbasins.

Follow the steps below to add or remove states, HUC6s or HUC8s to your area of interest. Your area of interest can be adjusted at any time when using the ***Set Up & Run a Screening*** page. However, you must click the green **Proceed to Next Step** button when you are done making adjustments or else the changes will not be reflected on subsequent tabs.





The states, HUC6s and HUC8s that are added to your area of interest will be listed in the table on the right side of the page under the **Area of Interest** header.

A map and count of HUC12s included in your screening will display below the table.

A state, HUC6 or HUC8 can be removed from your area of interest by highlighting its row in the table and clicking the **Remove Highlighted Row from Area of Interest** button.

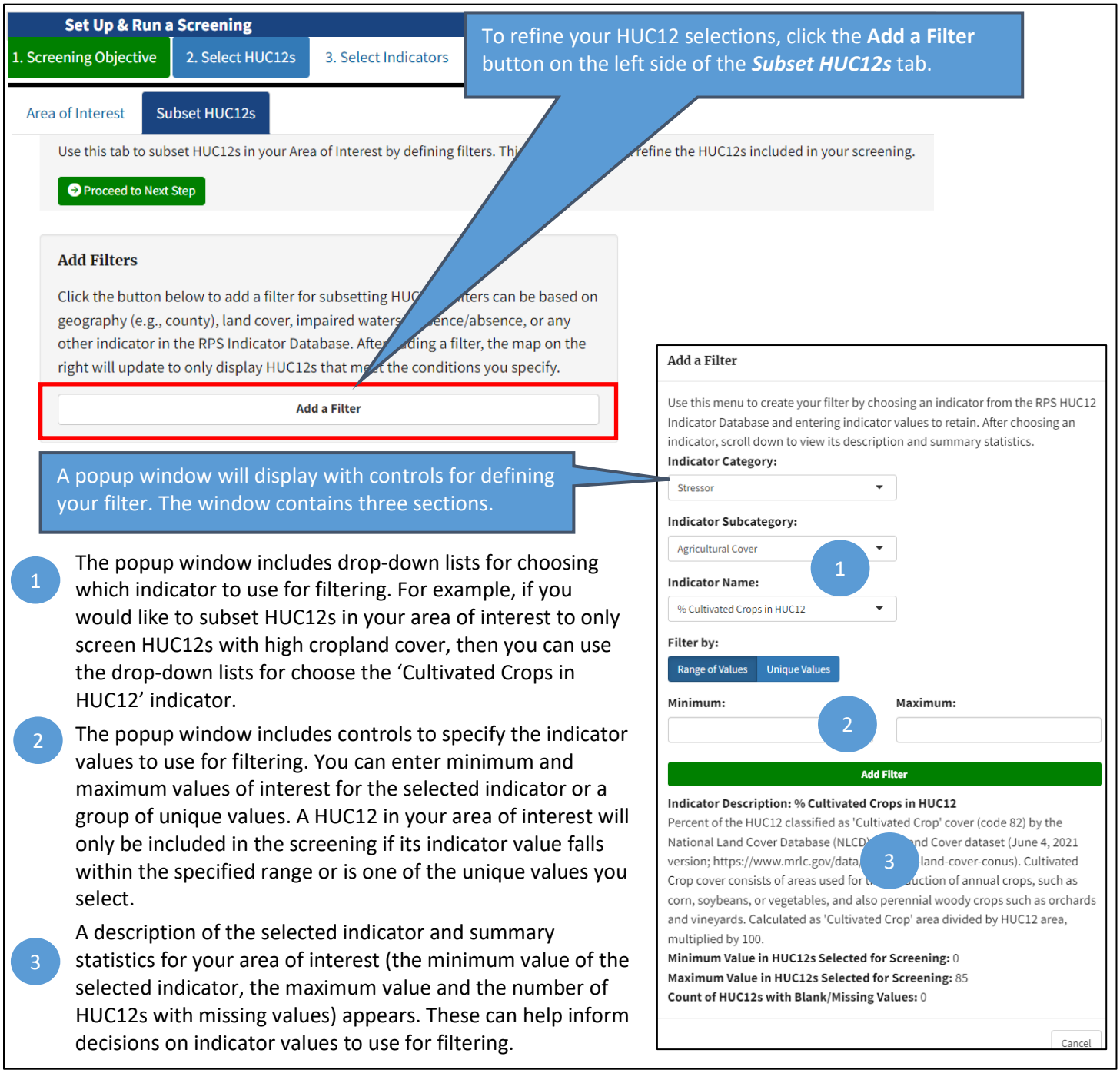
When you are done adding or removing states, HUC6s or HUC8s from your area of interest, click the **Proceed to Next Step** button to go to the ***Subset HUC12s*** subtab.

4.4.3. Subset HUC12s

The ***Subset HUC12s*** subtab allows users to further refine the HUC12s included in a screening. On the ***Subset HUC12s*** subtab you can define filters to select a smaller subset of HUC12s from your area of interest. Filters can use any indicator in the RPS Indicator Database and can reflect factors such as administrative boundaries (i.e. county), land cover or impaired waters presence/absence.

Filters can be added or removed by following the steps described below. Filters can be adjusted at any time when using the ***Set Up & Run a Screening*** page. However, you must click the green **Proceed to Next Step** button when you are done making adjustments or else the changes will not be reflected on subsequent tabs.

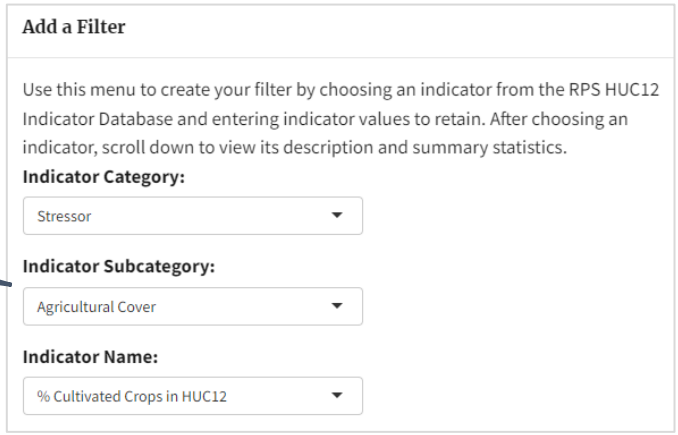
You can also skip this step by clicking the green **Proceed to Next Step** button if you would like to include all HUC12s in your area of interest in your screening.



1. The popup window includes drop-down lists for choosing which indicator to use for filtering. For example, if you would like to subset HUC12s in your area of interest to only screen HUC12s with high cropland cover, then you can use the drop-down lists for choose the 'Cultivated Crops in HUC12' indicator.
2. The popup window includes controls to specify the indicator values to use for filtering. You can enter minimum and maximum values of interest for the selected indicator or a group of unique values. A HUC12 in your area of interest will only be included in the screening if its indicator value falls within the specified range or is one of the unique values you select.
3. A description of the selected indicator and summary statistics for your area of interest (the minimum value of the selected indicator, the maximum value and the number of HUC12s with missing values) appears. These can help inform decisions on indicator values to use for filtering.

To create a filter in the **Add a Filter** popup window, first choose the indicator that you would like to use for filtering.

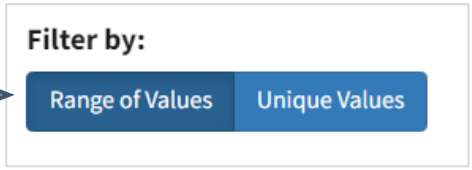
Use the drop-down lists to select the indicator category, subcategory and name.



Next, choose a method for specifying indicator values to use for filtering from the **Filter By** options.

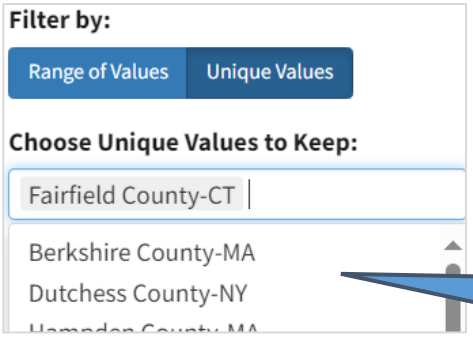
The **Range of Values** option allows you to specify minimum and maximum values of interest for the selected indicator. HUC12s with indicator values in the specified range will be included in your screening.

The **Unique Values** option allows you to select one or more unique values of interest for the selected indicator. HUC12s with the specified values will be included in your screening. The unique values option will typically only be used for categorical indicators.



If you choose the **Range of Values** method, enter minimum and maximum values of interest for the selected indicator in the text boxes.

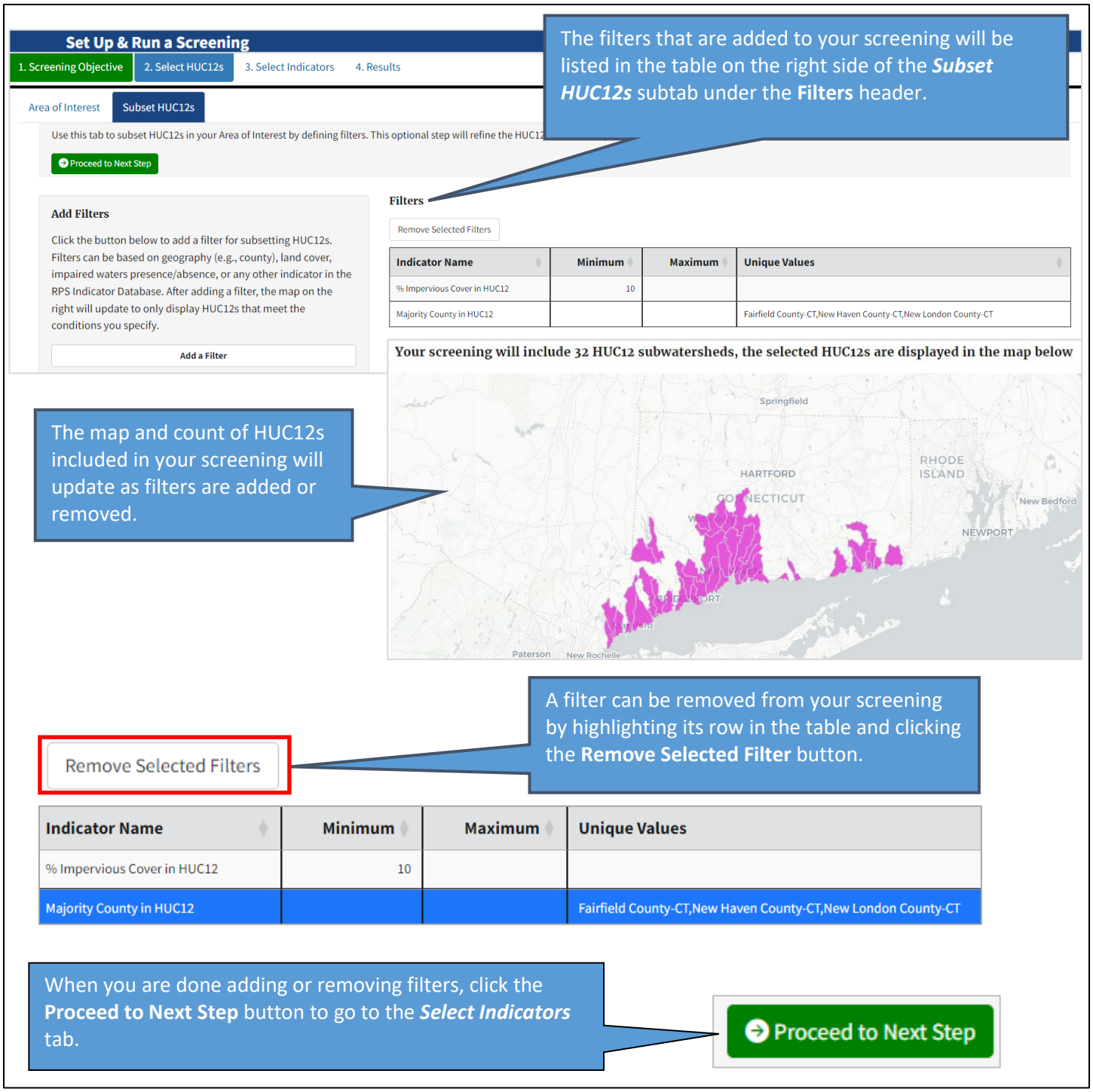
For example, if you selected a land cover indicator for filtering and would like to screen HUC12s with at least 50% of the selected land cover type, enter 50 in the **Minimum** text box and 100 in the **Maximum** text box.



If you choose the **Unique Values** method, a drop-down list of unique values for the selected indicator will display.

Use the drop-down list to select one or more values for filtering.

When you are done selecting an indicator and specifying indicator values, click the **Add Filter** button to apply your selections to your screening.

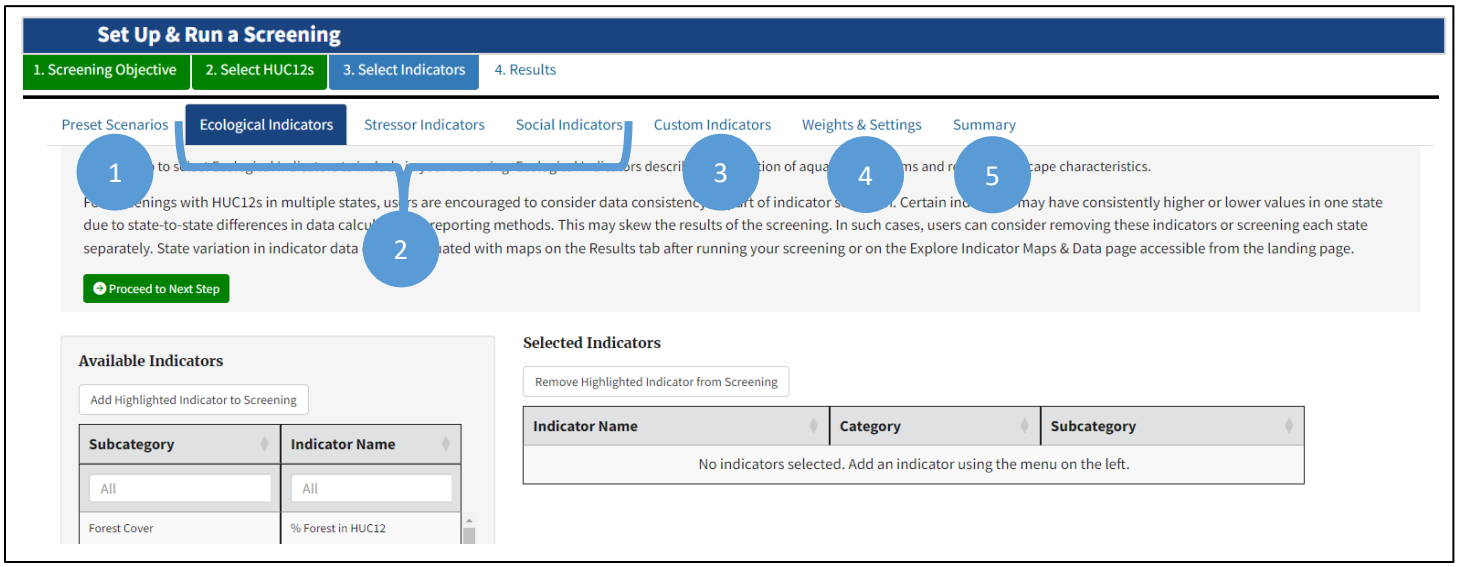

Set Up & Run a Screening
1. Screening Objective
2. Select HUC12s
3. Select Indicators
4. Results
Area of Interest
Subset HUC12s
Use this tab to subset HUC12s in your Area of Interest by defining filters. This optional step will refine the HUC12
Proceed to Next Step
Add Filters
Click the button below to add a filter for subsetting HUC12s. Filters can be based on geography (e.g., county), land cover, impaired waters presence/absence, or any other indicator in the RPS Indicator Database. After adding a filter, the map on the right will update to only display HUC12s that meet the conditions you specify.
Add a Filter
Filters
Remove Selected Filters
Indicator Name
Minimum
Maximum
Unique Values
% Impervious Cover in HUC12
10
Majority County in HUC12
Fairfield County-CT,New Haven County-CT,New London County-CT
Your screening will include 32 HUC12 subwatersheds, the selected HUC12s are displayed in the map below
Springfield
HARTFORD
RHODE ISLAND
New Bedford
NEWPORT
Paterson
New Rochelle
The filters that are added to your screening will be listed in the table on the right side of the Subset HUC12s subtab under the Filters header.
The map and count of HUC12s included in your screening will update as filters are added or removed.
Remove Selected Filters
A filter can be removed from your screening by highlighting its row in the table and clicking the Remove Selected Filter button.
Indicator Name
Minimum
Maximum
Unique Values
% Impervious Cover in HUC12
10
Majority County in HUC12
Fairfield County-CT,New Haven County-CT,New London County-CT
When you are done adding or removing filters, click the Proceed to Next Step button to go to the Select Indicators tab.
Proceed to Next Step

4.5. Select Indicators

4.5.1. Overview

The ***Select Indicators*** tab on the ***Set Up & Run a Screening*** page contains subtabs for choosing indicators to include in your screening and configuring indicator settings.

Indicators form the basis of HUC12 comparisons in the RPS Tool and are used to calculate index scores for each screened HUC12. The choice of which indicators to use for a screening depends on the objective of the screening and the nature of the HUC12s being screened. Thus, users should already have an understanding of candidate indicators to include in their screening prior to using the ***Select Indicators*** tab. The ***Explore Indicator Maps & Data*** page of the Web RPS Tool (Section 3) can be used to understand the indicators available in the RPS Indicator Database and inform candidate indicator selections.



A description of each subtab in the ***Select Indicators*** tab is provided below:

1. On the ***Preset Scenario*** subtab, you can optionally choose a pre-defined screening scenario to use as a starting point for indicator selection. This step is intended to assist users who have a basic understanding of RPS concepts but are uncertain about how to begin indicator selection. Choosing a scenario will automatically add a group of example indicators to the screening which are relevant to that scenario.

2. On the ***Ecological Indicators***, ***Stressor Indicators*** and ***Social Indicators*** subtabs you will select indicators from the RPS Indicator Database to include in your screening in three categories: ecological, stressor and social.

3. On the ***Custom Indicators*** subtab, you can optionally upload custom indicator data for the HUC12s included in your screening. Custom indicators are calculated by users and can be used instead of, or in addition to, indicators in the RPS Indicator Database.

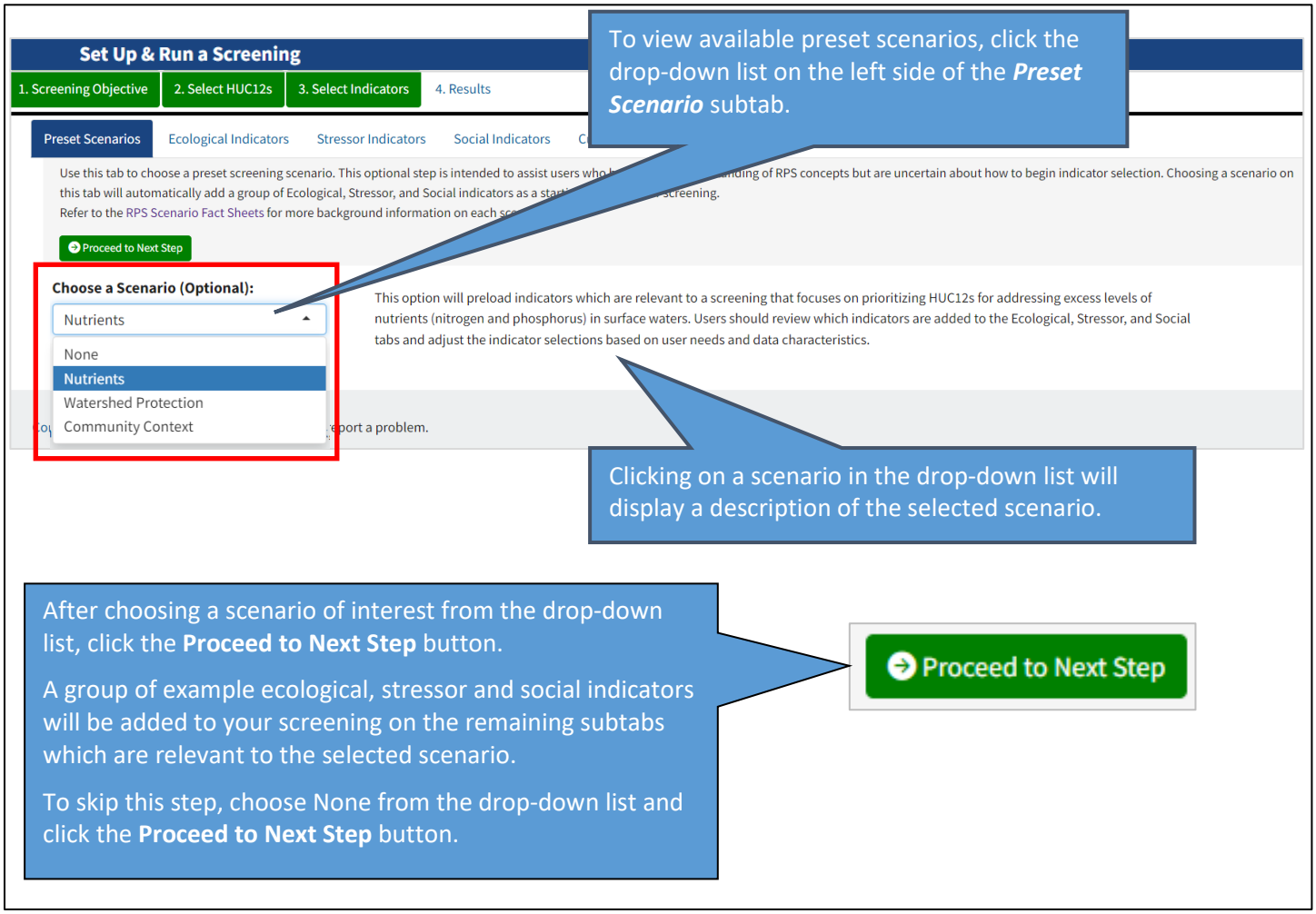
4. On the ***Weights & Settings*** subtab, you will adjust indicator weights and other settings that are used to calculate the screening results, such as the category assigned to an indicator or whether to apply an adjustment to reduce the effect of extreme outliers on results.

5. The ***Summary*** subtab contains a list of your selected indicators, weights and settings for review before running a screening.

4.5.2. Preset Scenarios

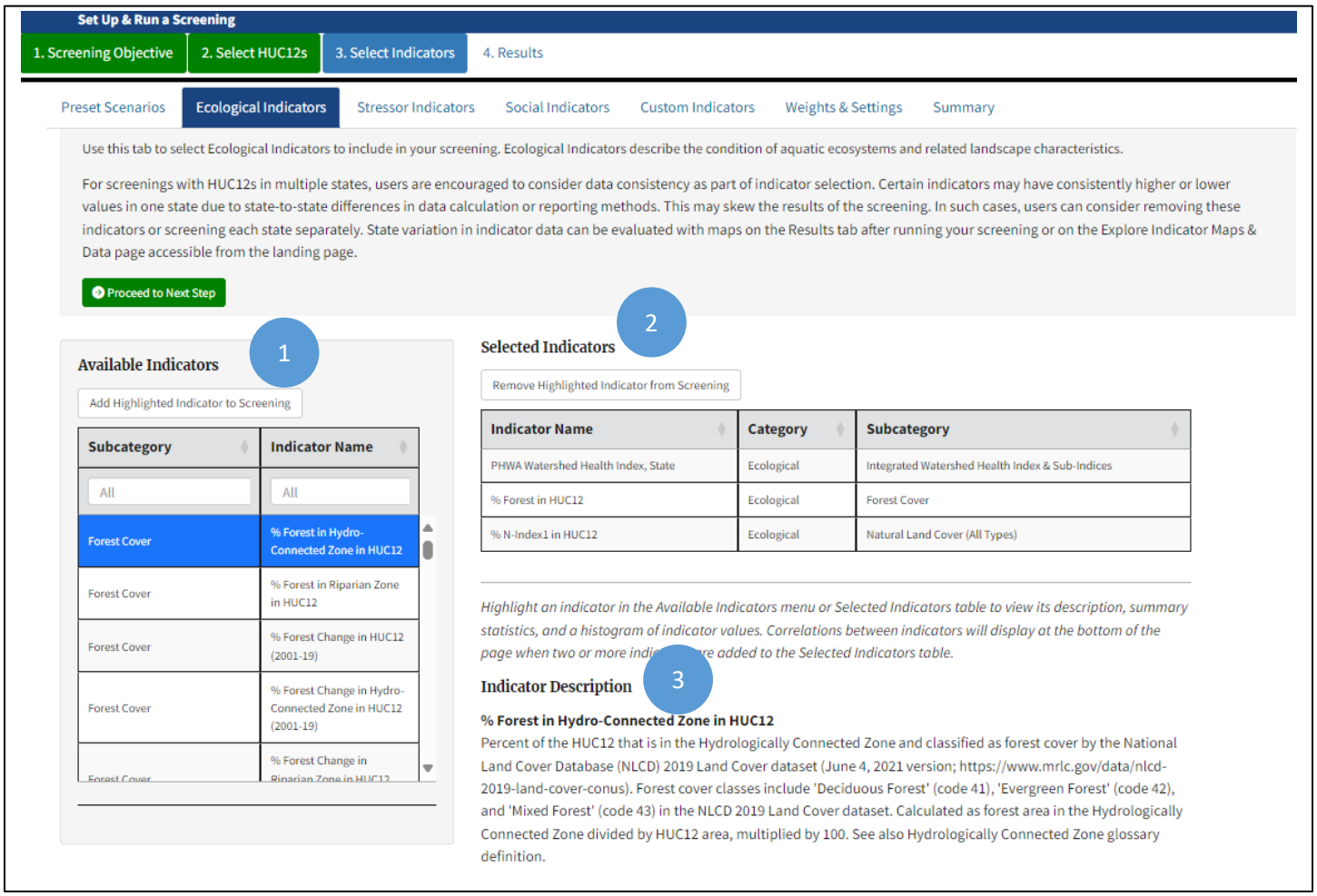
The ***Preset Scenarios*** subtab enables users to select a pre-defined screening scenario to use as a starting point for indicator selection. This step is intended to assist users who have a basic understanding of RPS concepts but are uncertain about how to begin indicator selection. Choosing a scenario will automatically add a group of example ecological, stressor and social indicators to the screening which are relevant to that scenario. When using a preset scenario, indicator selections, weights and settings can be refined on other subtabs to better reflect user-specific screening objectives and characteristics of the screened HUC12s.

Users that are interested in using a preset scenario are encouraged to read about the scenarios in the RPS Scenario Fact Sheets Series prior to running their screening. The fact sheets describe each preset scenario and describe example indicators from the RPS Indicator Database that are relevant to the scenarios.



4.5.3. Ecological, Stressor and Social Indicators

The ***Ecological Indicators***, ***Stressor Indicators*** and ***Social Indicators*** subtabs contain controls for choosing indicators from the RPS Indicator Database to include in your screening.



The ***Ecological Indicators***, ***Stressor Indicators*** and ***Social Indicators*** subtabs all share the same layout:

1. The Available Indicators section contains a table of indicators available in the RPS Indicator Database. The table can be sorted and filtered by subcategory and is searchable by indicator name. Each subtab only displays available indicators for the category in the subtab name (for example, the ***Ecological Indicators*** subtab only displays available ecological indicators).

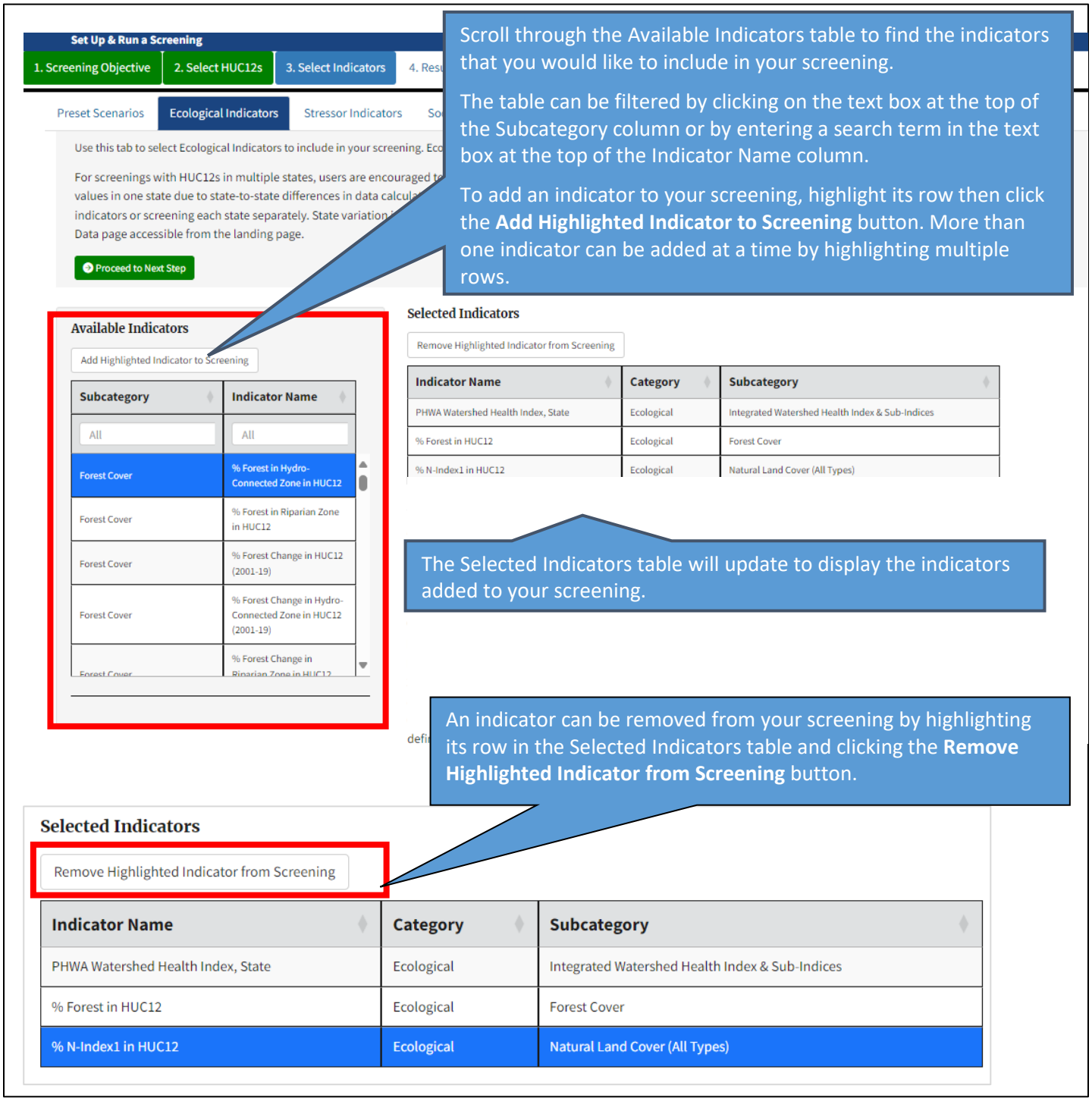
2. The Selected Indicators section contains a table of indicators that you have selected for your screening. Each subtab only displays indicator selections for the category in the subtab name (for example, the ***Ecological Indicators*** subtab only displays ecological indicator selections).

3. The space below the Selected Indicators table displays information to help inform indicator selection. This includes a description of the indicator which is highlighted in the Available Indicators or Selected Indicators table, summary statistics and a histogram that describe the statistical distribution of indicator values and a chart displaying correlation between pairs of selected indicators.

The instructions below describe steps for adding indicators from the Available Indicators table to your screening. A screening must include at least one indicator from each category (ecological, stressor and social).

Your indicator selections can be adjusted at any time when using the ***Set Up & Run a Screening*** page. However, you must click the green **Proceed to Next Step** button when you are done making adjustments or else the changes will not be reflected on subsequent tabs.

Note that while the instructions below use screenshots from the ***Ecological Indicators*** subtab, the same steps also apply to the ***Stressor Indicators*** and ***Social Indicators*** subtabs.



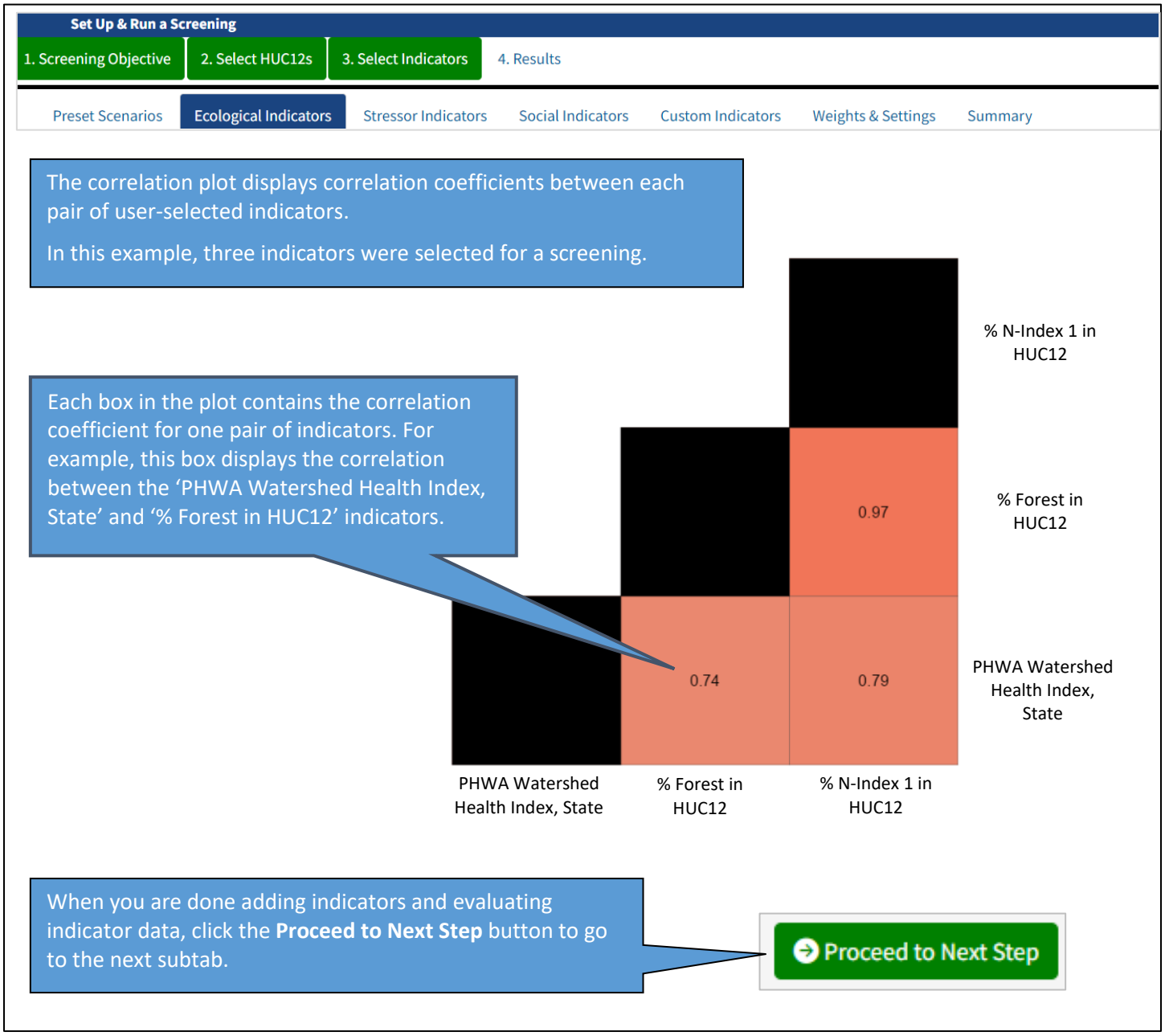
Scroll below the Selected Indicators table on the ***Ecological Indicators***, ***Stressor Indicators*** and ***Social Indicators*** subtabs to view indicator descriptions, histograms and summary statistics.

The statistical distribution of indicator values for the HUC12s included in your screening can be evaluated from the histogram and summary statistics table. The distribution of indicator values can inform decisions on whether to include an indicator in a screening. For example, indicators that cover a very small range of values may not convey meaningful differences between HUC12s, while indicators with extreme outliers may skew the screening results. The RPS Methods page of the EPA RPS website provides additional information on understanding and interpreting statistical distributions.

Continue scrolling below the histogram and summary statistics on the ***Ecological Indicators***, ***Stressor Indicators*** and ***Social Indicators*** subtabs to view a plot with the Pearson correlation coefficient (r) reported for each pair of indicators selected for your screening.

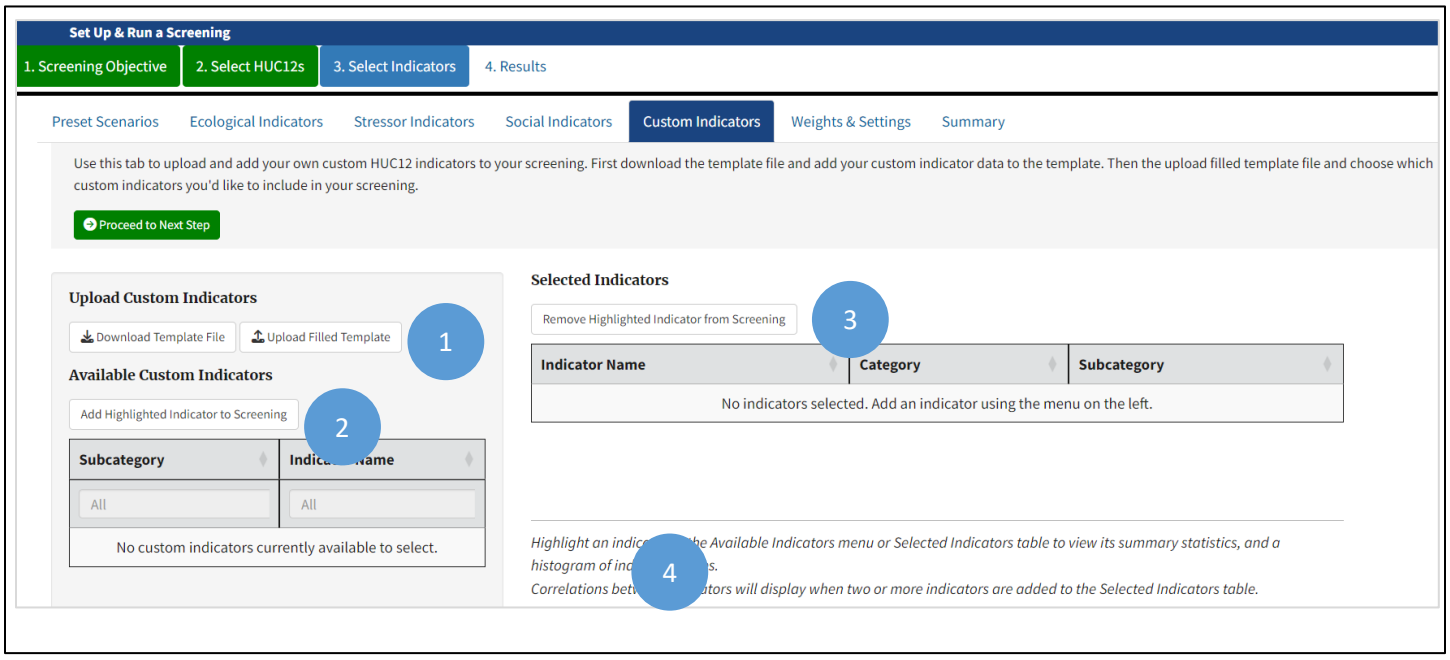
Correlations can be factored into decisions about which indicators to include in a screening. Indicator pairs with high positive correlation (for example, above 0.9) could be redundant and potentially add bias to the screening results. Indicator pairs with high negative correlation (for example, less than -0.9) could offset one another and reduce their

influence on the screening results. In these cases, one of the indicators from the correlated pair could be omitted from a screening.



4.5.4. Custom Indicators

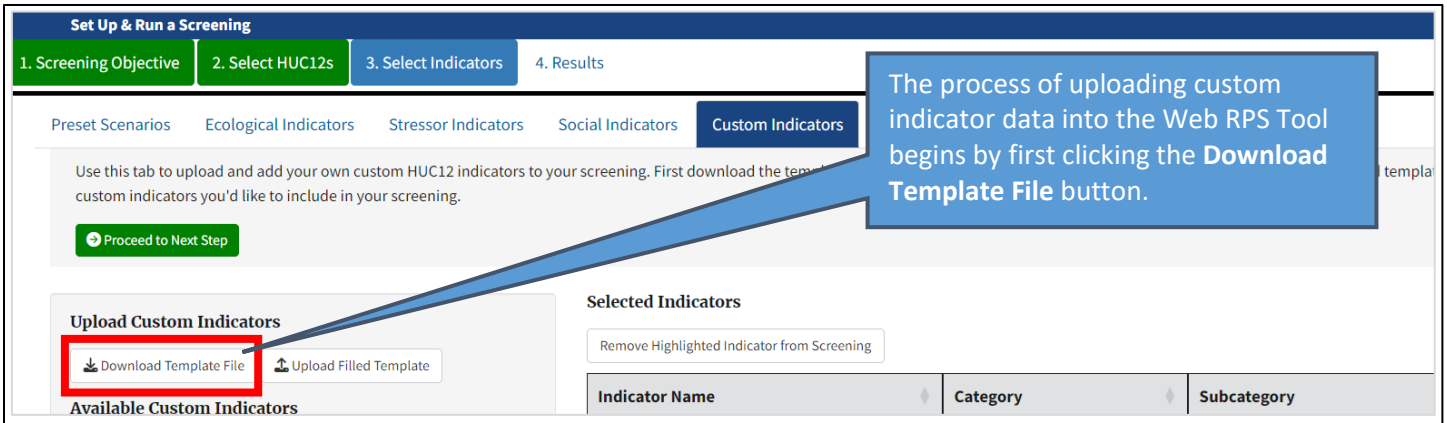
The ***Custom Indicators*** subtab enables users to upload their own HUC12 indicators for use in the Web RPS Tool. Use this tab to add HUC12 indicators that are not in the RPS Indicator Database to your screening. Uploading custom indicators is optional.



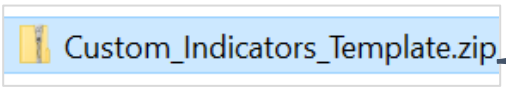
The ***Custom Indicators*** subtab shares a similar layout as the ***Ecological Indicators***, ***Stressor Indicators*** and ***Social Indicators*** subtabs but includes additional controls for uploading a file with custom indicator data:

1. The Upload Custom Indicators section contains buttons for downloading a template file to fill with custom indicator data and for uploading a filled template.
2. The Available Custom Indicators section contains a table that displays all the custom indicators that you have uploaded during your session and a button for adding the custom indicators to your screening.
3. The Selected Indicators section contains a table of custom indicators that you have selected for your screening.
4. The space below the Selected Indicators table displays information about the custom indicator data, including a histogram and summary statistics that describe the statistical distribution of indicator values and a chart displaying correlation between pairs of selected indicators.

The instructions below describe steps for downloading the template file for custom indicator data and filling out the template. Before completing these steps, you should already have custom indicator data calculated for the HUC12s included in your screening.

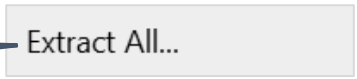


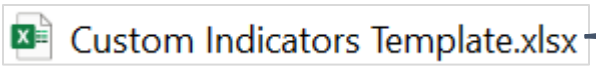
The process of uploading custom indicator data into the Web RPS Tool begins by first clicking the **Download Template File** button.



A compressed (.zip) file will be downloaded to your computer that contains the Microsoft Excel template file. The file will be stored in your web browser's default directory for file downloads. The filename will be 'Custom_Indicators_Template.zip'.

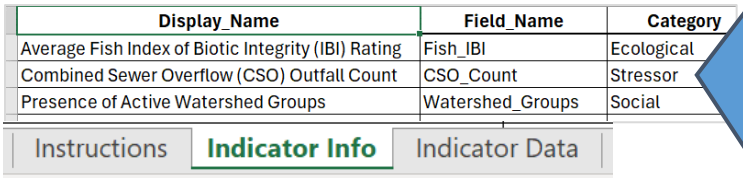
Extract the contents of 'Custom_Indicators_Template.zip' by right-clicking on the file, choosing 'Extract All…' and selecting a file path for storing the contents of the file.





Open the Excel template file from the file path you specified in the previous step.

The Excel template file contains three sheets: ***Instructions***, ***Indicator Info*** *and* ***Indicator Data***. Read the ***Instructions*** sheet to understand the contents of the file.



Display_Name	Field_Name	Category
Average Fish Index of Biotic Integrity (IBI) Rating	Fish_IBI	Ecological
Combined Sewer Overflow (CSO) Outfall Count	CSO_Count	Stressor
Presence of Active Watershed Groups	Watershed_Groups	Social

Go to the ***Indicator Info*** sheet of the Excel template. Complete the sheet by entering the following for each custom indicator that you would like to upload:

Display Name - This name will be displayed in the tool's tables, maps and charts.

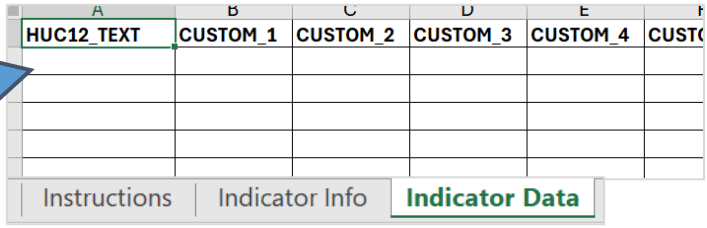
Field Name - This name will be used in the tool's programming code. It should not contain any spaces or special characters. Underscores and numbers are acceptable.

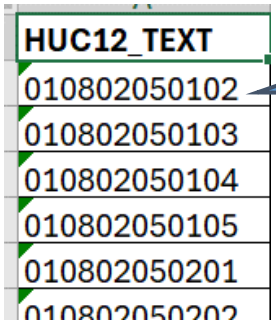
Category - This is the indicator category that the custom indicator will be assigned to for calculating screening results. Allowable options are 'Ecological', 'Stressor' or 'Social'.

In this example, three custom indicators are being added.

Go to the ***Indicator Data*** sheet of the Excel template. By default, the sheet will contain 'HUC12_TEXT' in column A and placeholder field names in subsequent columns.

Complete the sheet by copying and pasting data for your custom indicators. The completed sheet should contain one row for each HUC12 and columns with indicator values.





The HUC12_TEXT column should contain 12-digit codes for the HUC12s included in your custom indicator dataset. **Do not change the column header.**

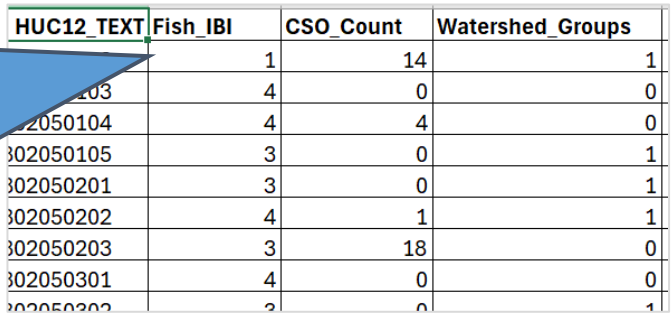
Make sure that any leading zeros in HUC12 codes are retained when pasting data from other files into the template. The column should be formatted as Text in Excel to ensure leading zeros are retained.

Your custom indicator data can contain rows for HUC12s that are not included in your screening. These rows will be skipped over by the Web RPS Tool when you upload the template file (i.e., the additional HUC12s will not be added to your screening). Any HUC12s in your screening that are missing from the template will be assigned blank values of the custom indicators in the Web RPS Tool.

The remaining columns of the ***Indicator Data*** sheet will contain values of your custom indicators for the HUC12s listed in the HUC12_TEXT column.

The column names used on the ***Indicator Data*** sheet must exactly match the Field Names entered on the ***Indicator Info*** sheet. The order of the columns does not need to match the order of indicators listed in the ***Indicator Info*** sheet.

The values of your custom indicators must be numeric. Only the HUC12_TEXT column can be non-numeric. Non-numeric entries in other columns will not be accepted by the Web RPS Tool.

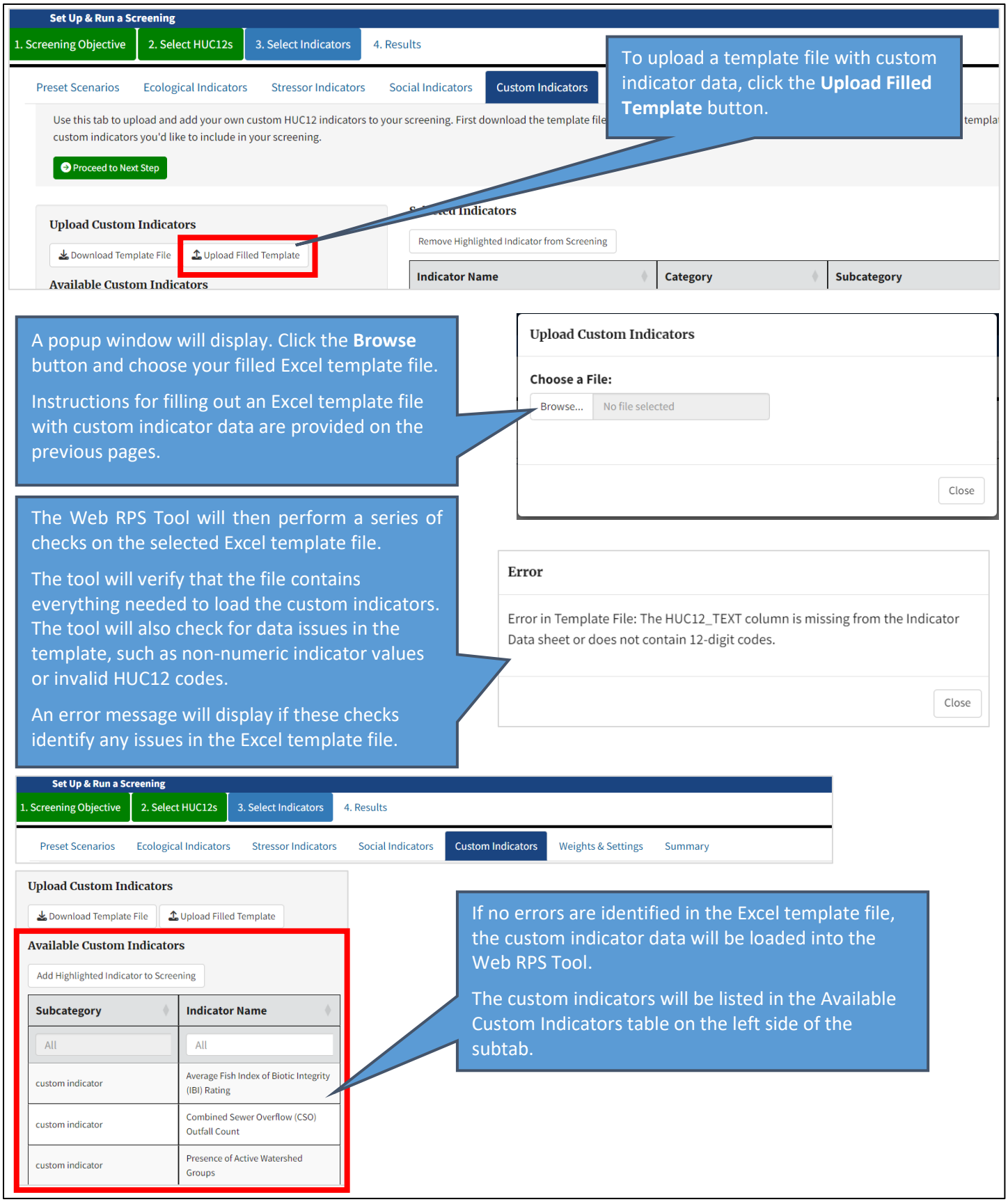


HUC12_TEXT	Fish_IBI	CSO_Count	Watershed_Groups
	1	14	1
103	4	0	0
2050104	4	4	0
302050105	3	0	1
302050201	3	0	1
302050202	4	1	1
302050203	3	18	0
302050301	4	0	0

Save the Excel template after filling out the ***Indicator Info*** and ***Indicator Data*** sheets.

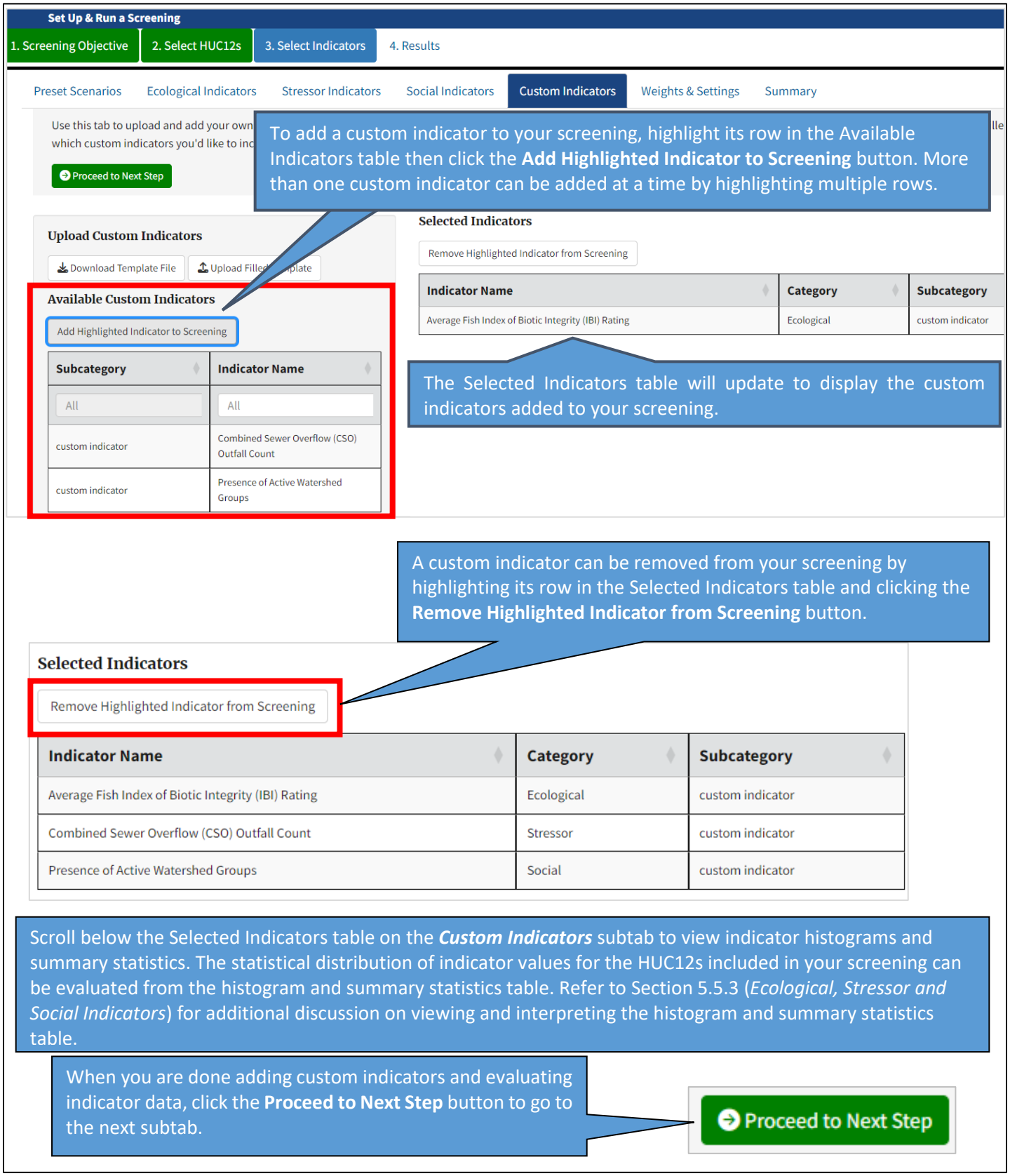
You can rename the template filename, but it must be saved in Excel Workbook (.xlsx) format.

The instructions below describe steps for loading a filled template file with custom indicator data into the Web RPS Tool. Users can repeat these steps to upload additional template files, however, any existing custom indicator data stored in the tool will be overwritten when a new template file is uploaded.



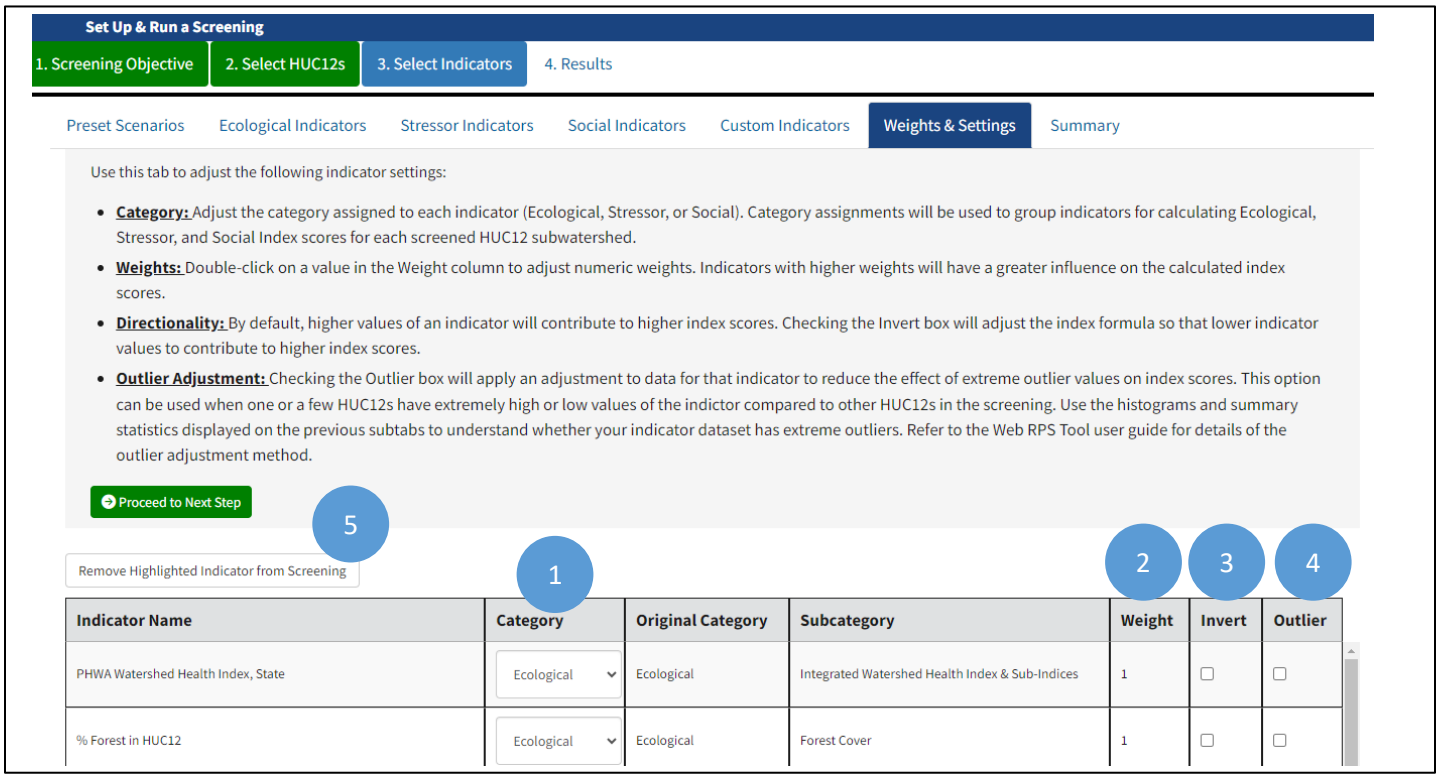
The instructions below describe steps for adding custom indicators to your screening.

Your custom indicator selections can be adjusted at any time when using the ***Set Up & Run a Screening*** page. However, you must click the green **Proceed to Next Step** button when you are done making adjustments or else the changes will not be reflected on subsequent tabs.



4.5.5. Weights and Settings

The ***Weights & Settings*** subtab enables users to assign weights to the indicators selected for the screening and adjust other settings that are used by the Web RPS Tool to calculate index scores. Appendix A documents the equations used in the Web RPS Tool for index score calculations.



The text below describes the available options on the ***Weights & Settings*** subtab:

1 In the **Category** column you can optionally use the drop-down lists to re-assign an indicator to a different category (Ecological, Stressor or Social). Indicators are assigned a default category in the RPS Indicator Database. However, you may be interested in moving the indicator to a different category for your screening.

2 In the **Weight** column you can optionally increase or decrease the weight assigned to each indicator. Weights determine the relative influence of each indicator on the index scores calculated by the Web RPS Tool. Indicators with higher weights will have a greater influence on index scores than indicators with lower weights.

Weights must be numeric, but any set of numeric values can be used. A typical approach is to select a certain number of weight categories (e.g., 3 = high; 2 = medium; 1 = low) and assign weights to indicators based on their relevance to the screening objectives and data quality considerations. By default, all indicators are assigned an equal weight of one.

To change indicator weights, double-click a value in the Weight column and then type a new value.

3 In the **Invert** column you can optionally choose to invert one or more indicators for index score calculations. When the Invert box is not checked, higher values of an indicator contribute to higher index scores. For example, HUC12s with higher values of ecological indicators will receive higher Ecological Index scores. This applies across all three indicator categories (Ecological, Stressor and Social).

For certain indicators in your screening, you may prefer to prioritize HUC12s with lower indicator values. In such cases, checking the Invert box will direct the Web RPS Tool to invert the directionality of the indicator as part of index score calculations (i.e., lower values of the indicator will contribute to higher index scores).

Note that when re-assigning an indicator using the Category column, it is important to consider how the indicator's directionality aligns with the new category. Depending on your screening objectives and the nature of the indicator data, you may need to check the Invert box for re-assigned indicators to ensure consistency with other indicators in the new category and your own interests.

4 In the **Outlier** column you can optionally choose to apply an outlier adjustment to an indicator for index score calculations.

When outlier adjustment is applied, HUC12s with extreme values of an indicator are re-assigned new values that more closely align with other HUC12s in the screening. This statistical approach for limiting extreme values in a dataset is also called winsorizing. Specifically, HUC12s with indicator values that are greater than the 99th percentile for the group of screened HUC12s are re-assigned the 99th percentile value; HUC12s with indicator values that are less than the 1st percentile value are re-assigned the 1st percentile value.

5 If you decide to no longer use an indicator in your screening, you can highlight its row in the table and click the **Remove Highlighted Indicator from Screening** button.

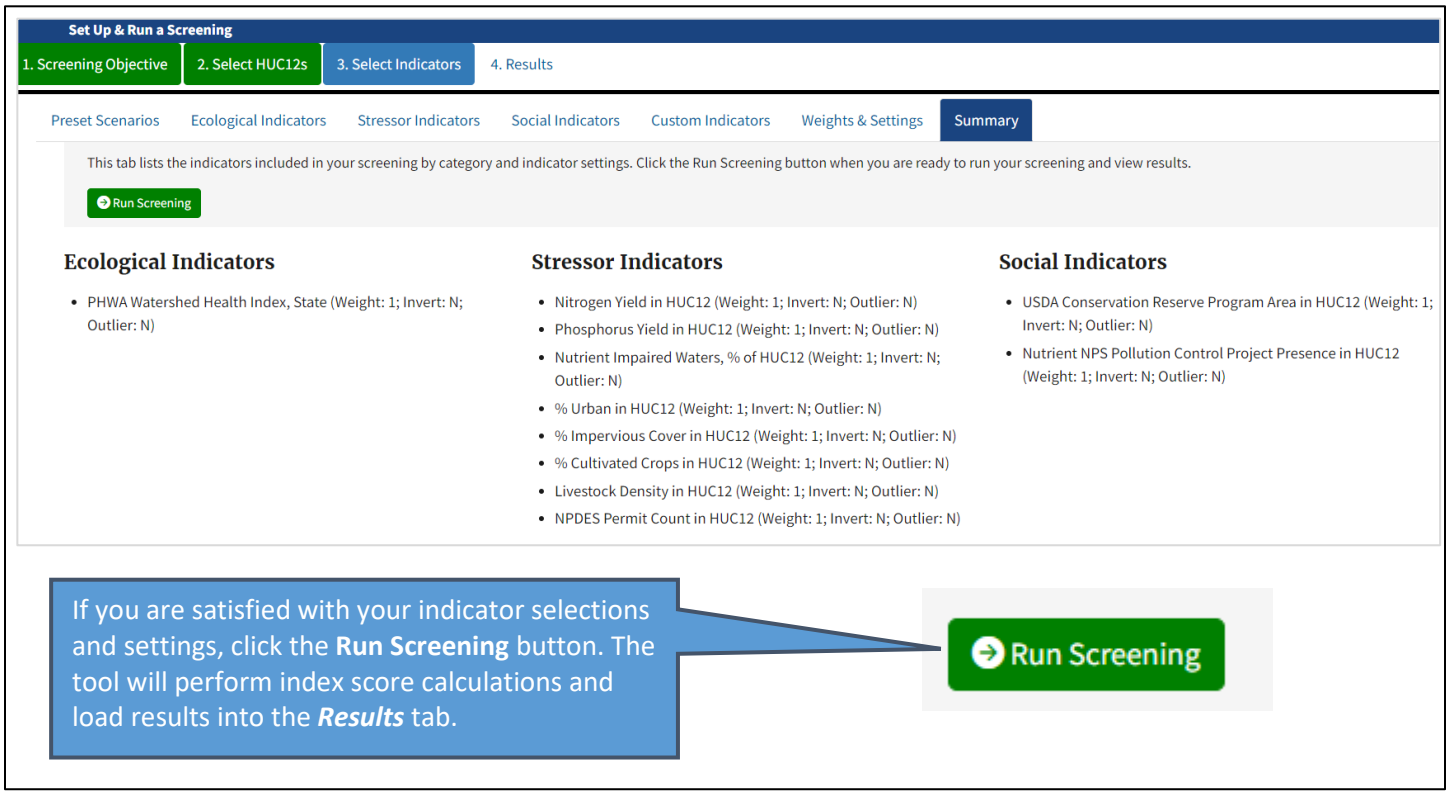
Your indicator weights and settings can be adjusted at any time when using the ***Set Up & Run a Screening*** page. However, you must click the green **Proceed to Next Step** button when you are done making adjustments or else the changes will not be reflected on subsequent tabs.

4.5.6. Summary

The ***Summary*** subtab provides an overview of the indicators selected for a screening and displays the following for each indicator:

- The category assigned to the indicator (Ecological, Stressor or Social).
- The weight assigned to the indicator.
- Whether the indicator will be inverted for index score calculations.
- Whether outlier adjustment will be applied to the indicator for index score calculations.

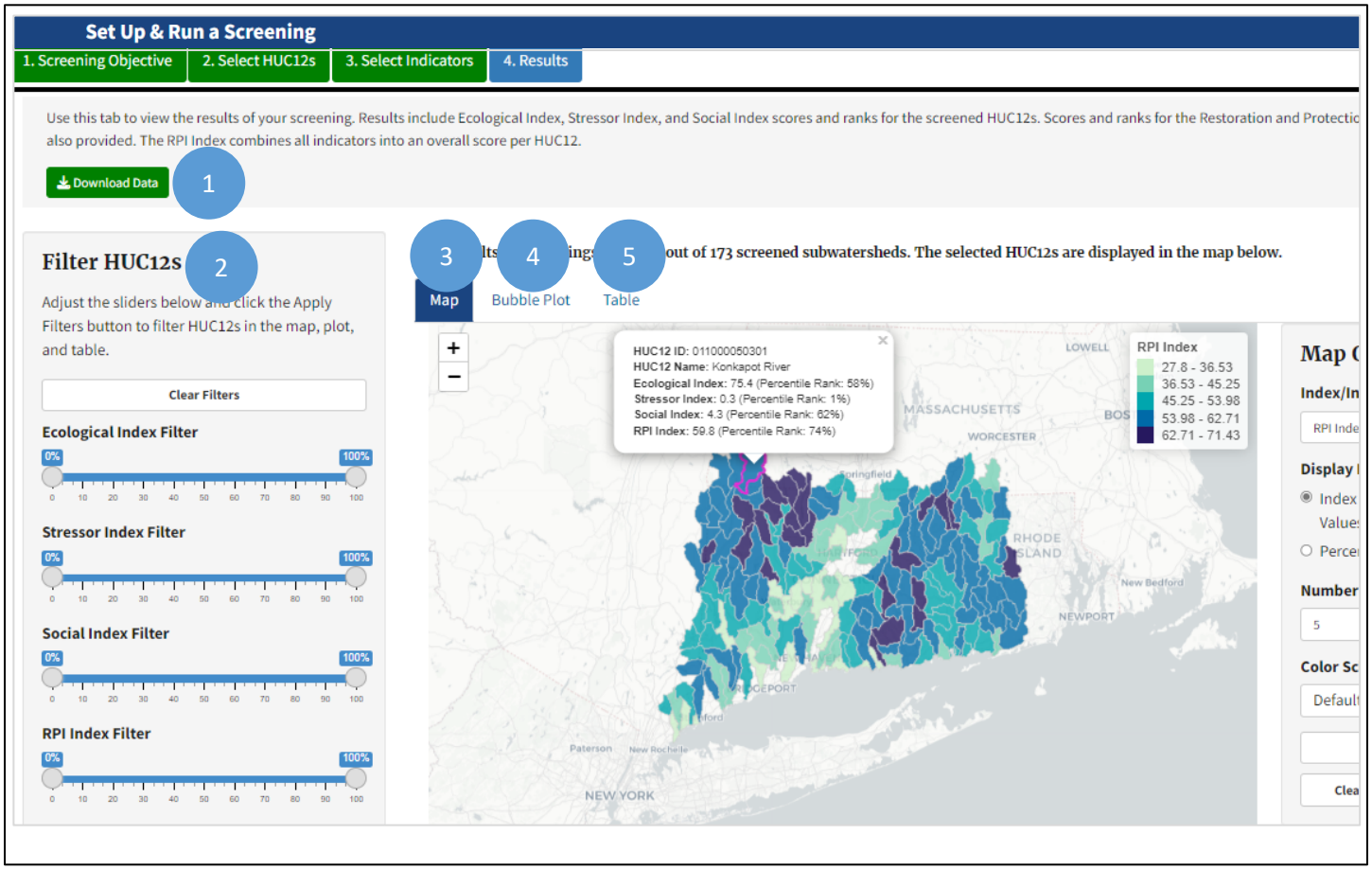
If you would like to adjust your indicator selections, weights or other settings after reviewing the ***Summary*** subtab you can click on the previous subtabs and make any necessary changes. However, you must click the **Proceed to Next Step** button on any subtabs where changes are made or else the changes will not be reflected on the **Summary** subtab.



4.6. Results

4.6.1. Overview

The ***Results*** tab on the ***Set Up & Run a Screening*** page contains a customizable map, plot and table for viewing and understanding the results of a screening. The screening results can also be downloaded from the ***Results*** tab.



A description of the contents of the ***Results*** tab is provided below:

1. The **Download Data** button is used to download a file containing your screening results (i.e., index scores and indicator data for the HUC12s included in your screening).

2. In the ***Filter HU12s*** sidebar you can adjust which HUC12s are displayed on the ***Map***, ***Bubble Plot*** and ***Table*** subtabs. The slider bars in the ***Filter HU12s*** sidebar can be adjusted to only display HUC12s which have index scores or indicator values within a specific range.

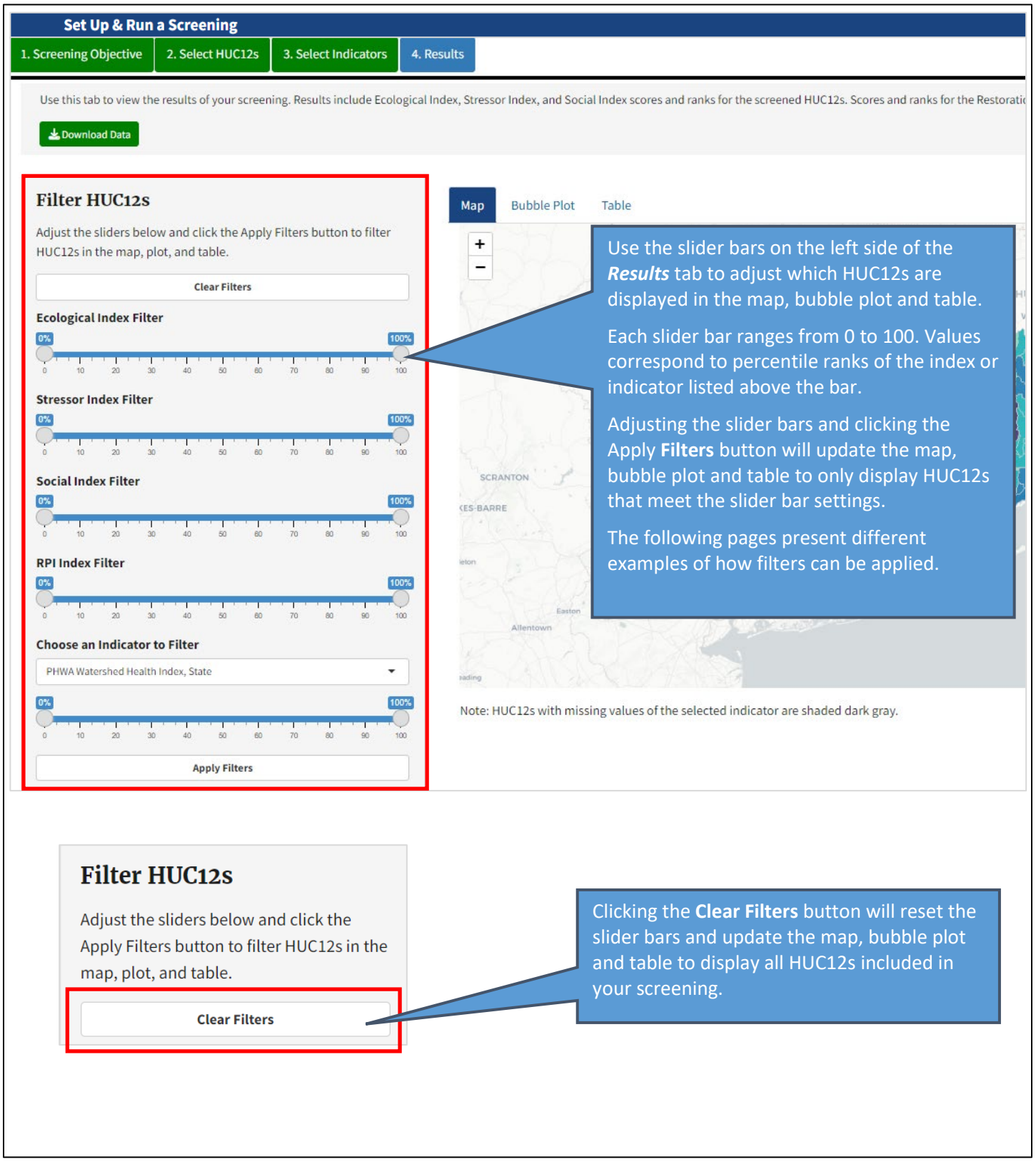
3. On the ***Map*** subtab you can view and customize maps of index scores and indicator data for the HUC12s included in your screening.

4. On the ***Bubble Plot*** subtab you can view and customize a plot that displays index scores for the HUC12s included in your screening.

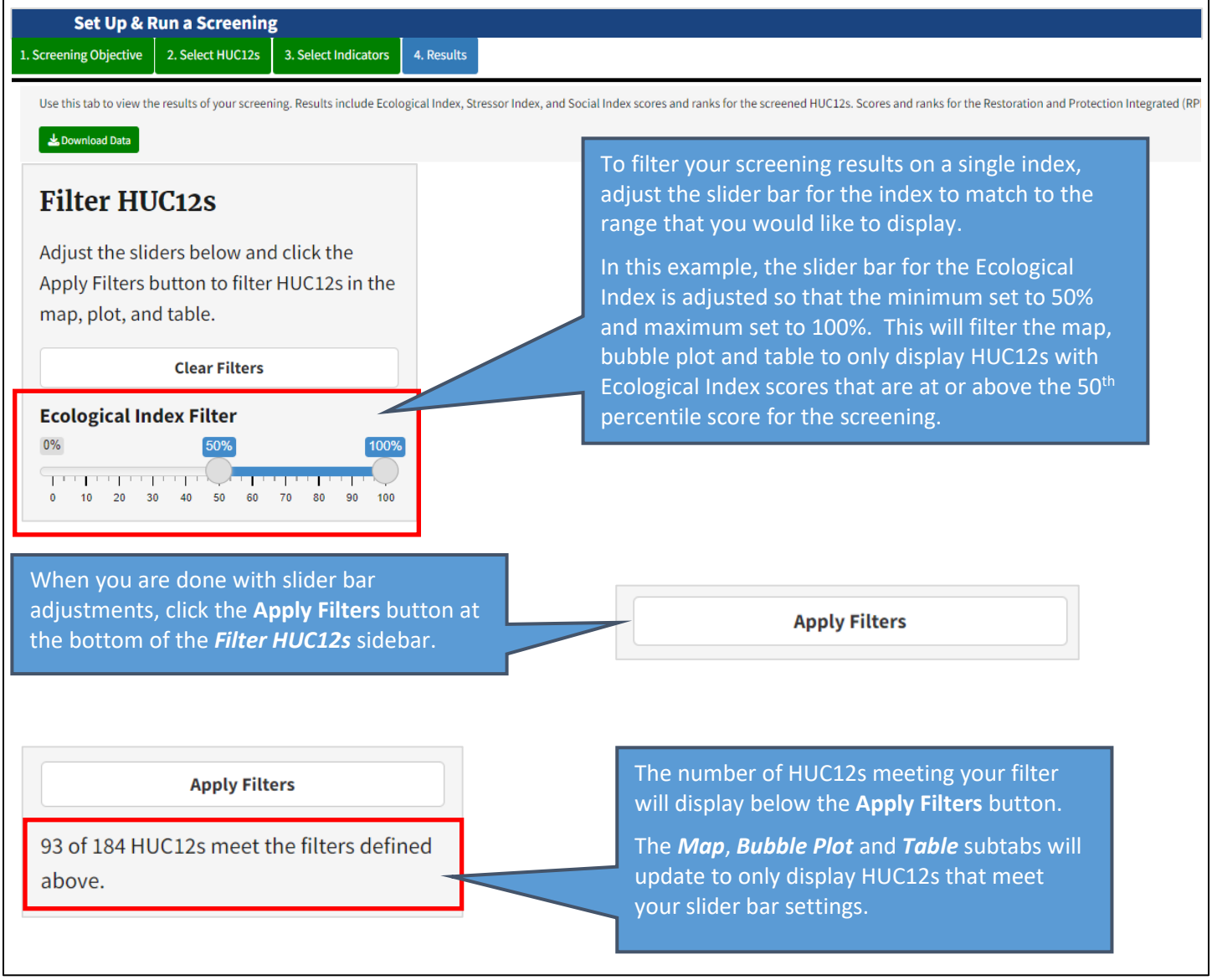
5. On the ***Table*** subtab you can view a table of index scores and indicator data for the HUC12s included in your screening.

4.6.2. Filter HUC12s

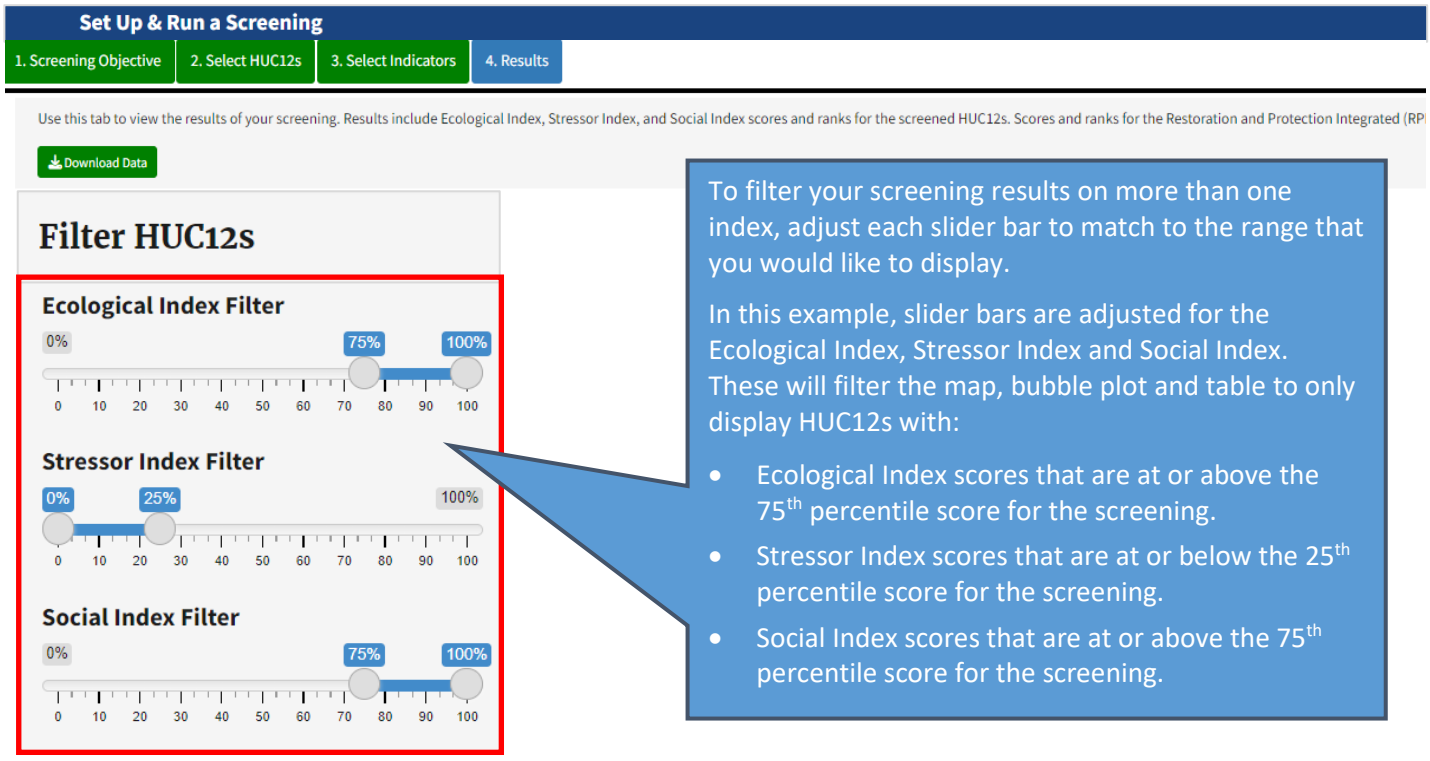
The ***Filter HUC12s*** sidebar is used to adjust the HUC12s that are displayed in the ***Map***, ***Bubble Plot*** and ***Table*** subtabs. By default, all HUC12s included in a screening are displayed in the map, bubble plot and table. Applying filters will only display HUC12s that have index scores or indicator values within a specific range. The filters can be used to pinpoint HUC12s with a desired combination of index scores or indicator values for further evaluation and prioritization.



Example #1: Filter your screening results using a single index.



Example #2: Filter your screening results using more than one index.

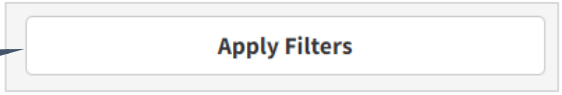


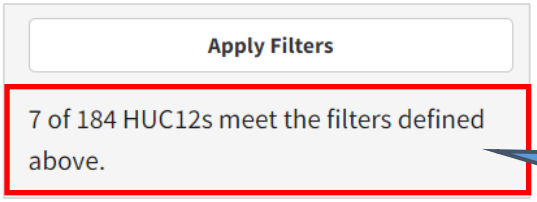
To filter your screening results on more than one index, adjust each slider bar to match to the range that you would like to display.

In this example, slider bars are adjusted for the Ecological Index, Stressor Index and Social Index. These will filter the map, bubble plot and table to only display HUC12s with:

- Ecological Index scores that are at or above the 75th percentile score for the screening.
- Stressor Index scores that are at or below the 25th percentile score for the screening.
- Social Index scores that are at or above the 75th percentile score for the screening.

When you are done with slider bar adjustments, click the **Apply Filters** button at the bottom of the ***Filter HUC12s*** sidebar.

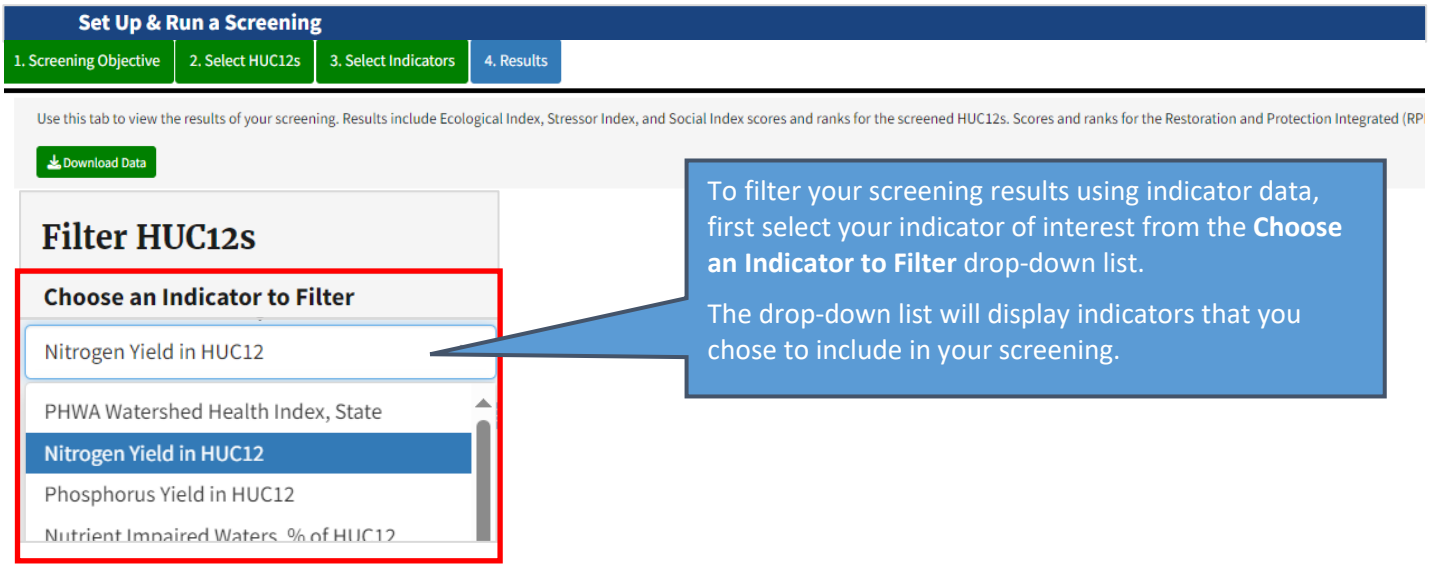




The number of HUC12s meeting your filters will display below the **Apply Filters** button.

The ***Map***, ***Bubble Plot*** and ***Table*** subtabs will update to only display HUC12s that meet all of the slider bar settings.

Example #3: Filter your screening results using an indicator.

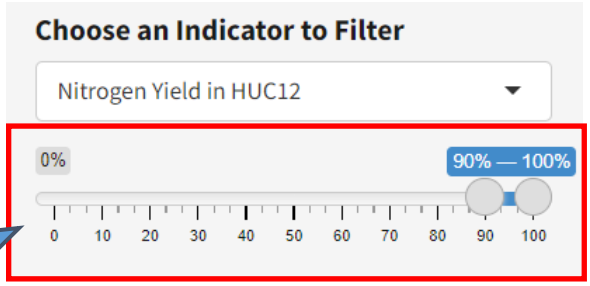


To filter your screening results using indicator data, first select your indicator of interest from the **Choose an Indicator to Filter** drop-down list.

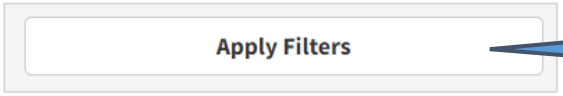
The drop-down list will display indicators that you chose to include in your screening.

Next adjust the slider bar for the selected indicator to match the range that you would like to display.

In this example, the slider bar is adjusted so that the minimum is set to 90% and the maximum is set to 100%. This will filter the map, bubble plot and table to only display HUC12s with nitrogen yields that are at or above the 90th percentile value for the screening.

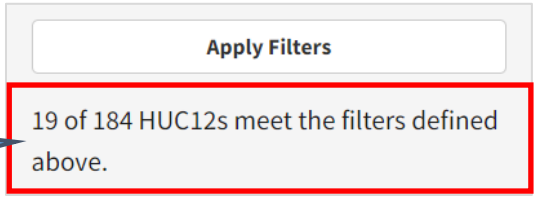


When you are done with slider bar adjustments, click the **Apply Filters** button at the bottom of the ***Filter HUC12s*** sidebar.



The number of HUC12s meeting your filter will display below the **Apply Filters** button.

The ***Map***, ***Bubble Plot*** and ***Table*** subtabs will update to only display HUC12s that meet the slider bar settings.

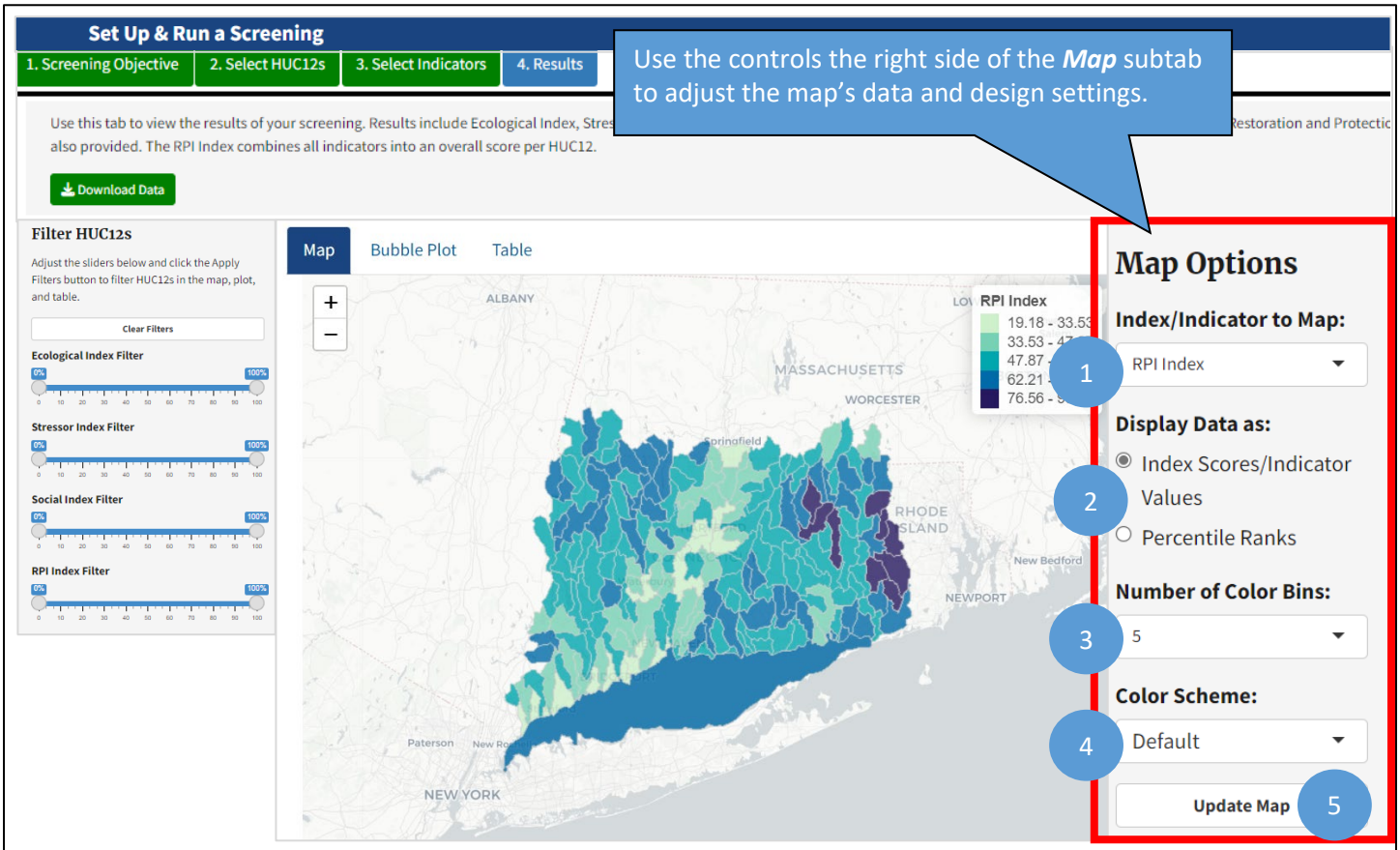


Note that you can filter by only one indicator at a time. However, an indicator-based filter can be combined with filters for index scores. To apply filters for an indicator and index scores, simply adjust the slider bars for the indicator and for the index scores of interest, then click the **Apply Filters** button. The ***Map***, ***Bubble Plot*** and ***Table*** subtabs will only display results for HUC12s that meet all of the slider bar settings.

4.6.3. Map

The ***Map*** subtab contains a customizable map for viewing index scores and indicator data for a screening. By default, the map displays all HUC12s included in the screening. Any filters that are applied in the ***Filter HUC12s*** sidebar will reduce the number of HUC12s displayed on the map.

The instructions below describe steps for adjusting the data displayed on the map and for customizing the map's design settings.



1. Choose which index or indicator to display on the map from the **Index/Indicator to Map** drop-down list. Options include the Ecological Index, Stressor Index, Social Index, RPI Index or any of the indicators in your screening.

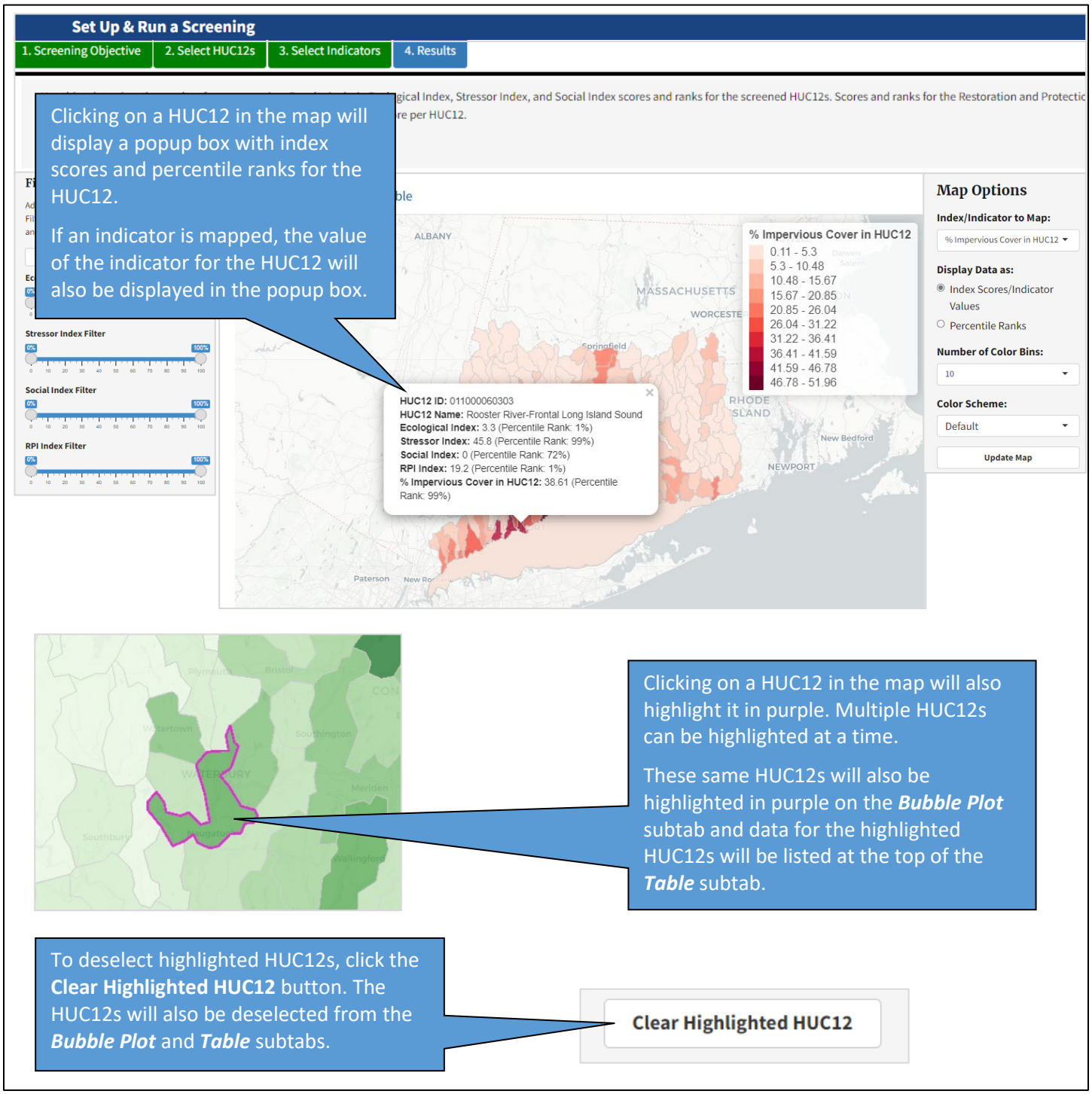
2. Use the **Display Data as** option buttons to choose how the data are reported on the map.
   - The **Index Scores/Indicator Values** option will display raw index scores or indicator values.
   - The **Percentile Rank** option will display the percentile rank of each HUC12 for the selected index or indicator. For example, a HUC12 with a percentile rank of 90 means that the HUC12 has an index or indicator value which is greater than 90% of all other HUC12s in the screening.

3. Use the **Number of Color Bins** drop-down list to choose how many different colors are displayed on the map. Up to 10 color bins can be selected.

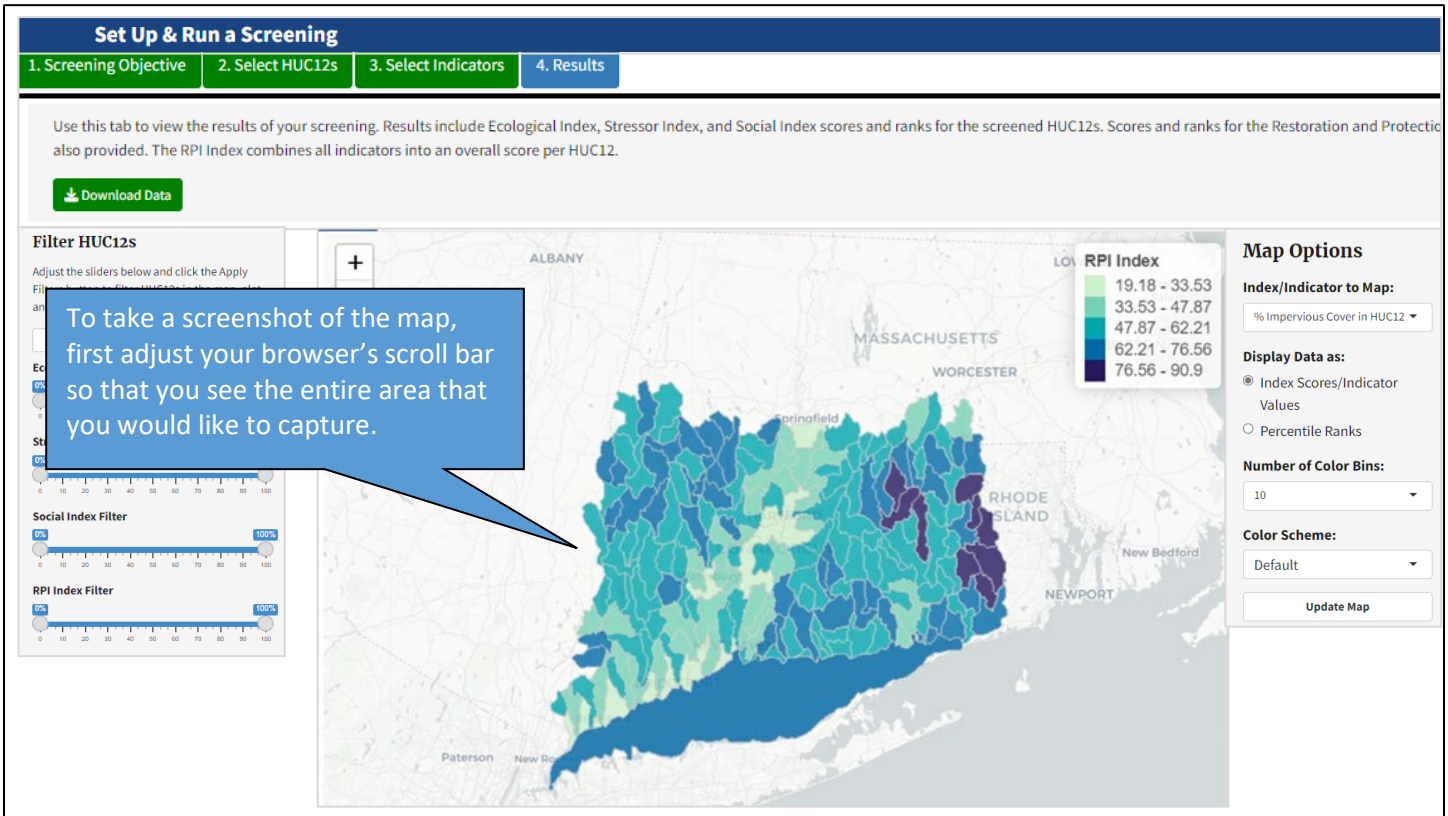
4. Use the **Color Scheme** drop-down list to choose a between a green, red or blue color scheme. By default, the Ecological Index and ecological indicators are shaded green, the Stressor Index and stressor indicators are red and the Social Index and social indicators are blue.

5. You must click the **Update Map** button to refresh the map with the new data and settings.

The map includes interactive features for further understanding and interpreting your screening results. The instructions below describe steps for using these interactive features.



The instructions below describe steps for saving a screenshot of the map for use in a report or presentation. The instructions below use the Snipping Tool that is a built-in feature of Windows 10 and 11. On a Mac, hold shift, command and 4 to capture a portion of the screen with a crosshair.



To take a screenshot of the map, first adjust your browser's scroll bar so that you see the entire area that you would like to capture.

Then launch the Snipping Tool with the following keyboard shortcut:

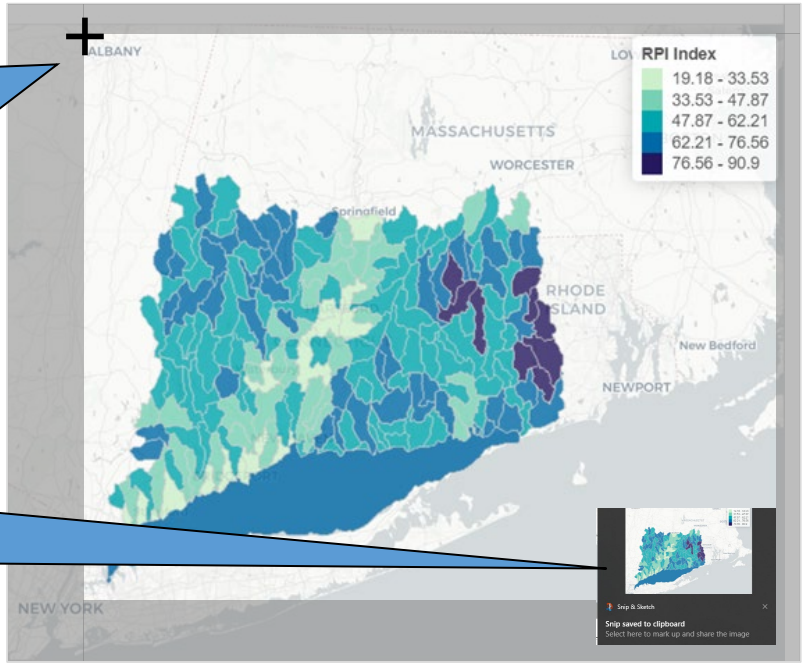
Windows logo key + Shift + S

(Press all three keys at the same time)

The screen will change slightly to gray. Click and drag your mouse cursor to select an area to screenshot.

When you release the mouse button, an image of the area you selected will be copied. Open your report or presentation file and paste the image from the clipboard.

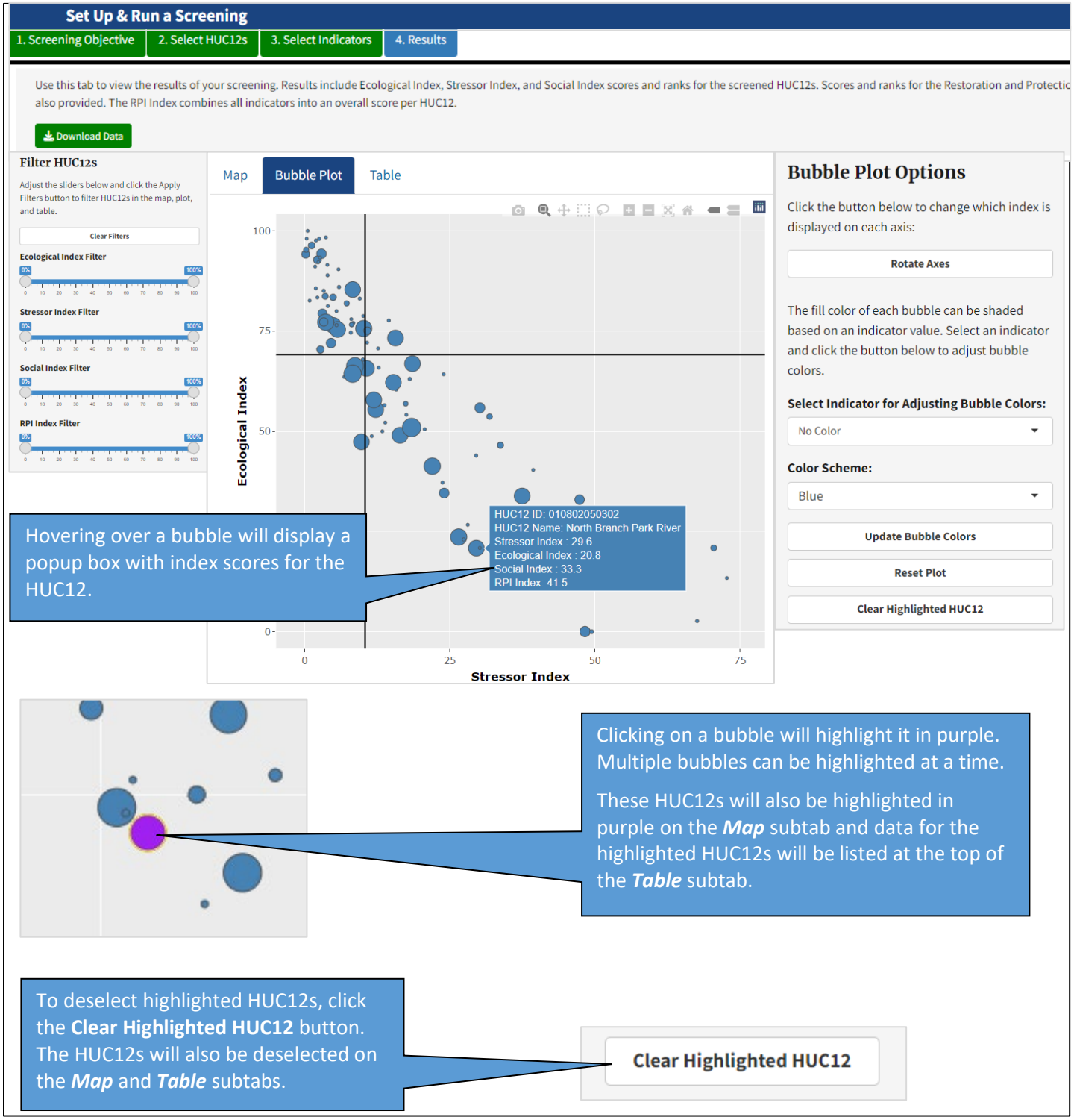
If you would like to save your screenshot as an image file, click the thumbnail that appears in the bottom-right corner of the screen. This will launch a window with a save option.



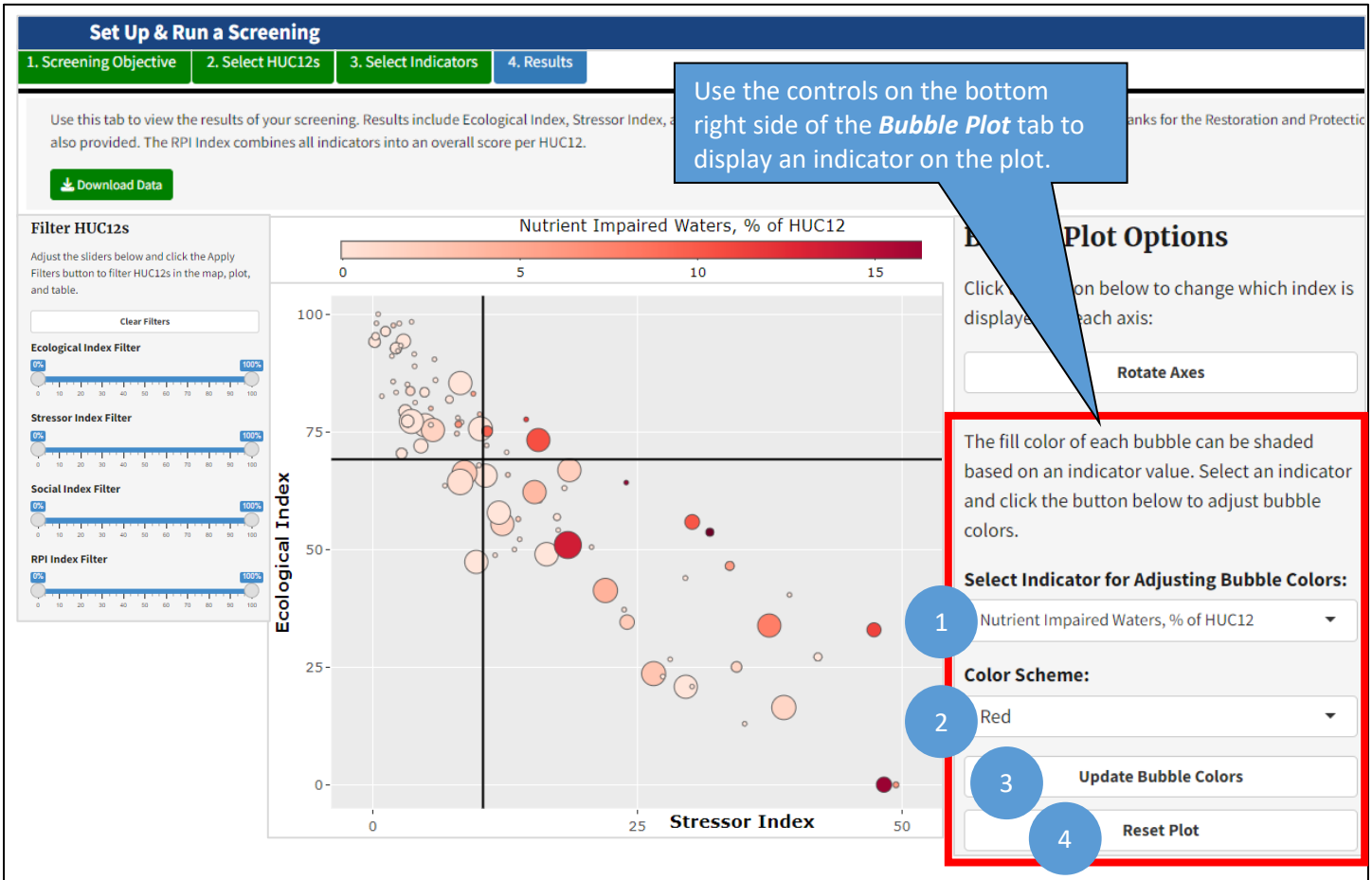
4.6.4. Bubble Plot

The ***Bubble Plot*** subtab contains a plot that displays your screening results. The plot contains one "bubble" for each HUC12 included in the screening. By default, Stressor Index scores are plotted on the horizontal (x) axis and Ecological Index scores are plotted on the vertical (y) axis. Social Index scores are plotted using bubble sizes. HUC12s with larger bubbles have higher Social Index scores relative to HUC12s with smaller bubbles. Any filters that are applied in the ***Filter HUC12s*** sidebar will reduce the number of HUC12s displayed on the bubble plot.

The bubble plot includes interactive features for further understanding and interpreting your screening results. The instructions below describe steps for using these interactive features.



The ***Bubble Plot*** subtab contains controls customizing the plot. The instructions below describe steps for displaying indicator data on the bubble plot using bubble colors.



1. Choose which indicator to display on the bubble plot from the **Select Indicator for Adjusting Bubble Colors** drop-down list. Options include any of the indicators in your screening.

2. Use the **Color Scheme** drop-down list to choose a between a green, red or blue color scheme.

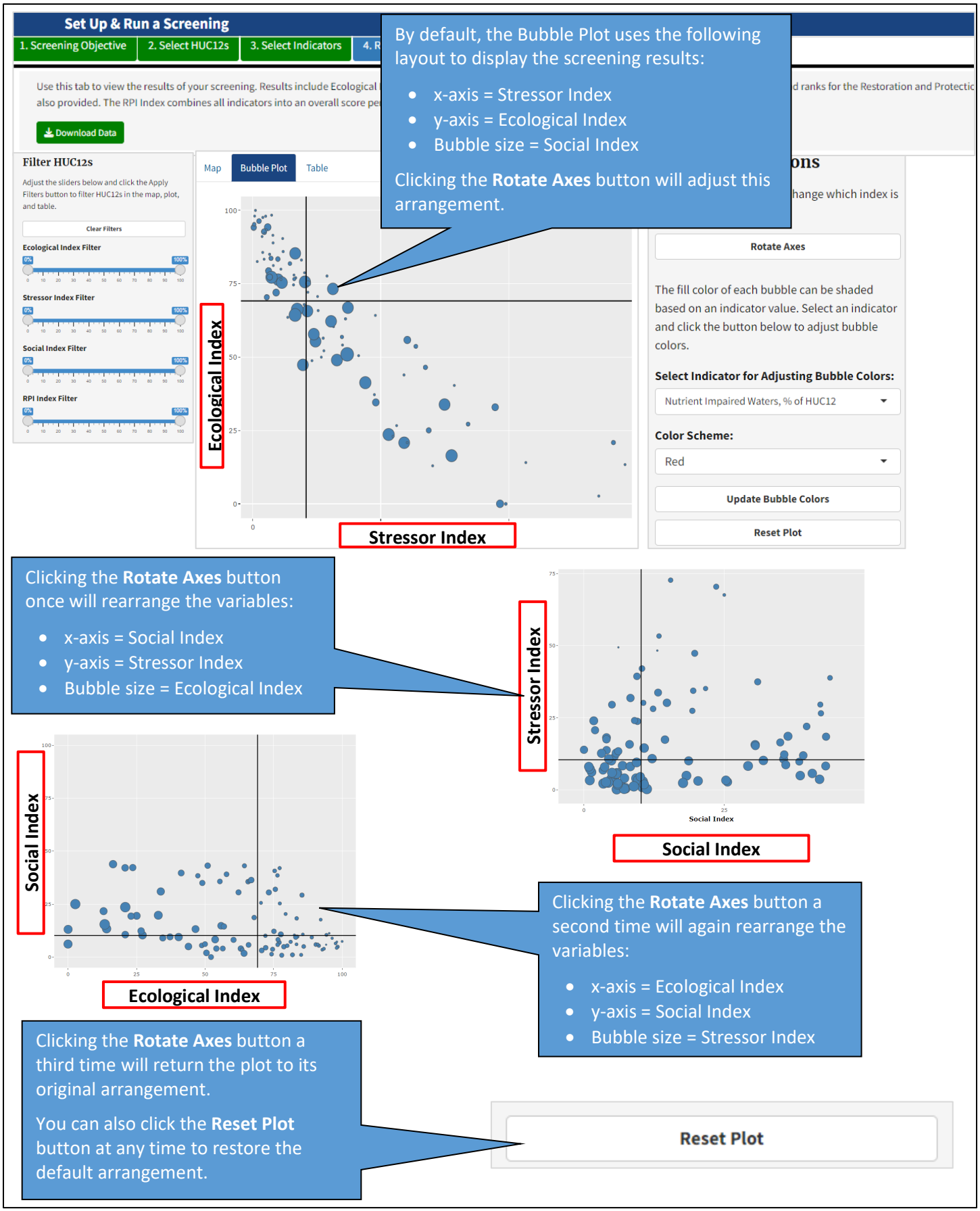
3. Click the **Update Bubble Colors** button to apply your selections and update the plot.

   A legend will display above the plot that shows how bubble colors vary with indicator values. HUC12s with larger values of the selected indicator will have darker bubbles; HUC12s with smaller values have lighter bubbles.

   Values of the selected indicator will also appear in the popup box that appears when hovering over a bubble.

4. Click the **Reset Plot** button at any time to remove the indicator from the plot and restore the default bubble color.

The instructions below describe steps for rearranging the axes of the bubble plot using the **Rotate Axes** button.



By default, the Bubble Plot uses the following layout to display the screening results:

- x-axis = Stressor Index
- y-axis = Ecological Index
- Bubble size = Social Index

Clicking the **Rotate Axes** button will adjust this arrangement.

Clicking the **Rotate Axes** button once will rearrange the variables:

- x-axis = Social Index
- y-axis = Stressor Index
- Bubble size = Ecological Index

Clicking the **Rotate Axes** button a second time will again rearrange the variables:

- x-axis = Ecological Index
- y-axis = Social Index
- Bubble size = Stressor Index

Clicking the **Rotate Axes** button a third time will return the plot to its original arrangement.

You can also click the **Reset Plot** button at any time to restore the default arrangement.

The instructions below describe how to use the bubble plot toolbar to further customize the plot.

The camera icon can be used to save the plot as an image file. A higher quality image can be generated by following the steps provided on the next page for capturing a screenshot of the plot.

The magnifier icon can be used to zoom into a specific area within the plot. After clicking on the icon, click and drag your mouse cursor in the plot to define your zoom extent. The plot will zoom into the area covered by the extent.

The pan icon can be used to drag a portion of the plot into the center of the window. After clicking on the icon, click and drag your mouse cursor within the plot. The plot will pan across the window as you drag the mouse.

The rectangle selection icon can be used to showcase one or more bubbles on the plot. After clicking on the icon, click and drag your mouse cursor within the plot. All bubbles within the selected area will be showcased by "graying out" the other unselected bubbles.

The lasso selection icon is similar to the rectangular selection icon but allows a freeform selection area to be defined for showcasing bubbles.

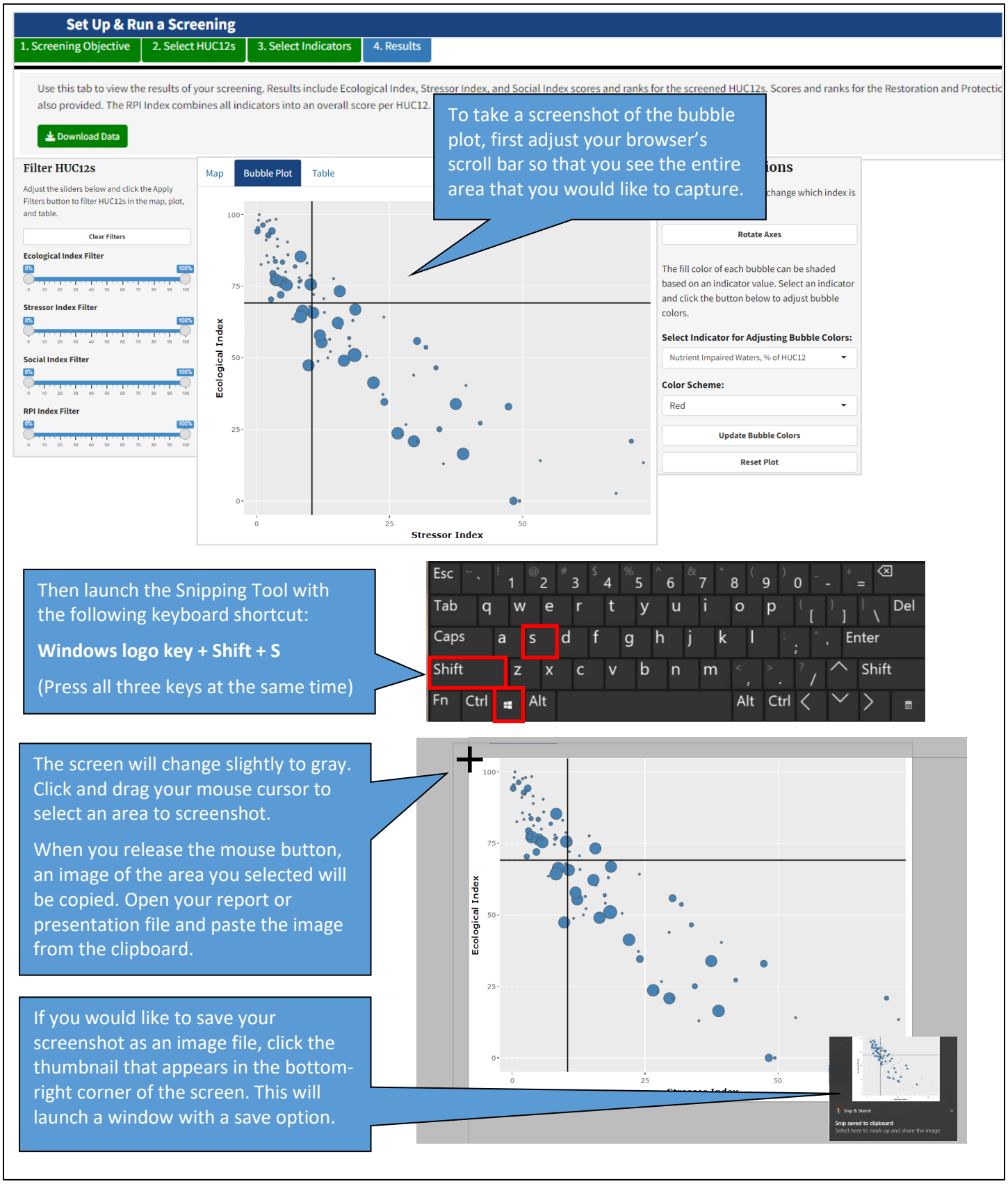
The zoom icons apply a fixed zoom into or out of the center of plot.

The full extent and home icons can both be used to restore the default zoom level and extent.

The popup icons control whether separate popup boxes are displayed when a plot contains multiple data series. The default option of a single popup box should always be selected to reduce the potential for display errors or bugs.

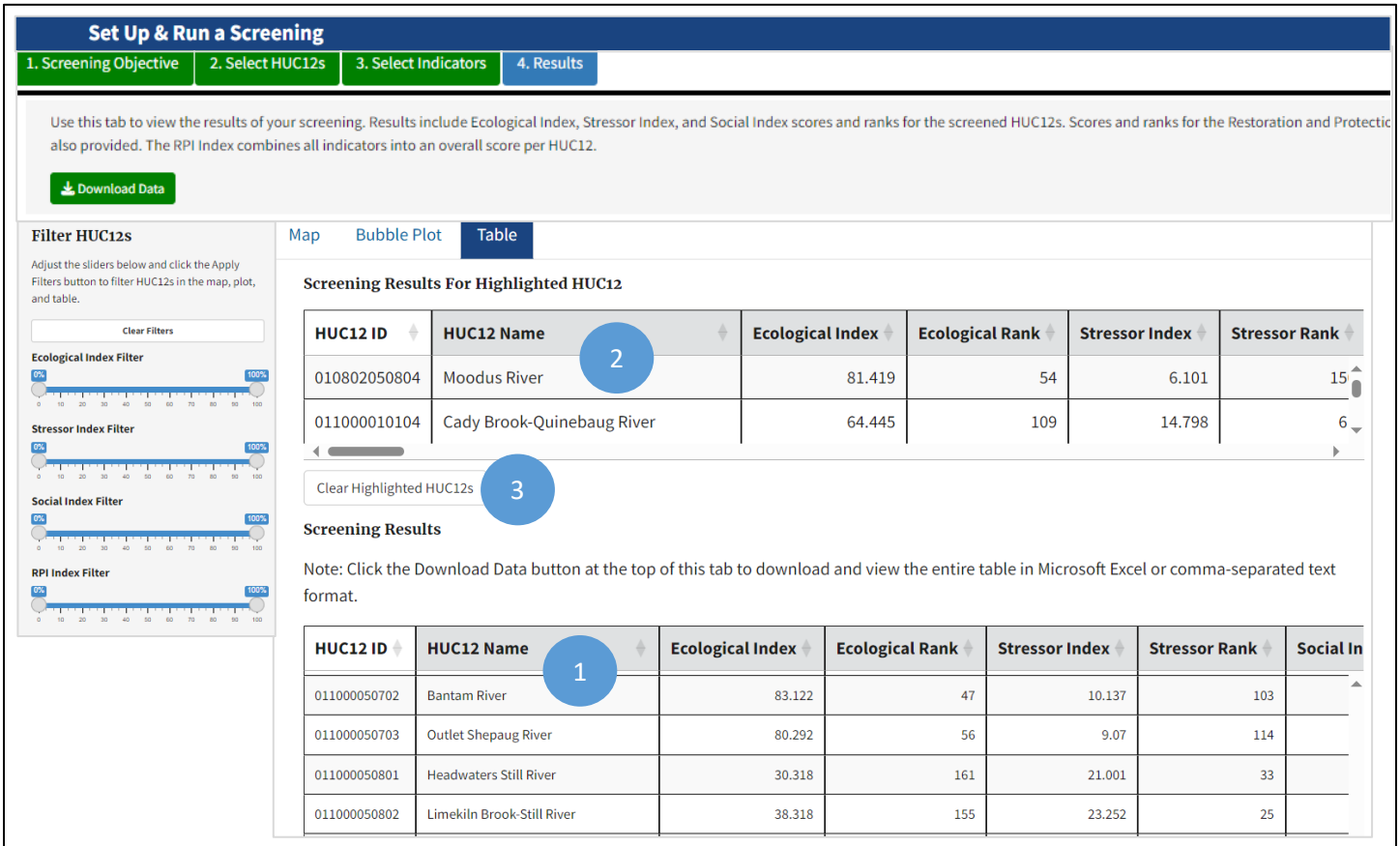
Click the **Reset Plot** button at any time to restore the default display settings.

The instructions below describe steps for saving a screenshot of the bubble plot for use in a report or presentation. The instructions use the Snipping Tool that is a built-in feature of Windows 10 and 11.



4.6.5. Table

The ***Table*** subtab contains tables with index scores and indicator data for your screening. A description of the subtab is provided below.



1 The **Screening Results** table is displayed at the bottom of the subtab**.** By default, this contains index scores and indicator data for all HUC12s included in your screening. Any filters that are applied in the ***Filter HUC12s*** sidebar will reduce the number of HUC12s displayed in the table.

The table can be sorted by clicking on the header row in any column. It displays up to 30 rows at a time. If your screening includes more than 30 HUC12s, use the navigation bar at the bottom of the table to see additional rows. You also can click the **Download Data** button at the top of the tab to download and view the entire table in Microsoft Excel or comma-separated text format.

Clicking on a row in the table will highlight that HUC12 on the ***Map*** and ***Bubble Plot*** subtabs. The row will also be added to the **Screening Results for Highlighted HUC12s** table (described below).

2 The **Screening Results for Highlighted HUC12s** table is displayed at the top of the subtab. This table only displays index scores and indicator data for HUC12s that are highlighted on the map and bubble plot.

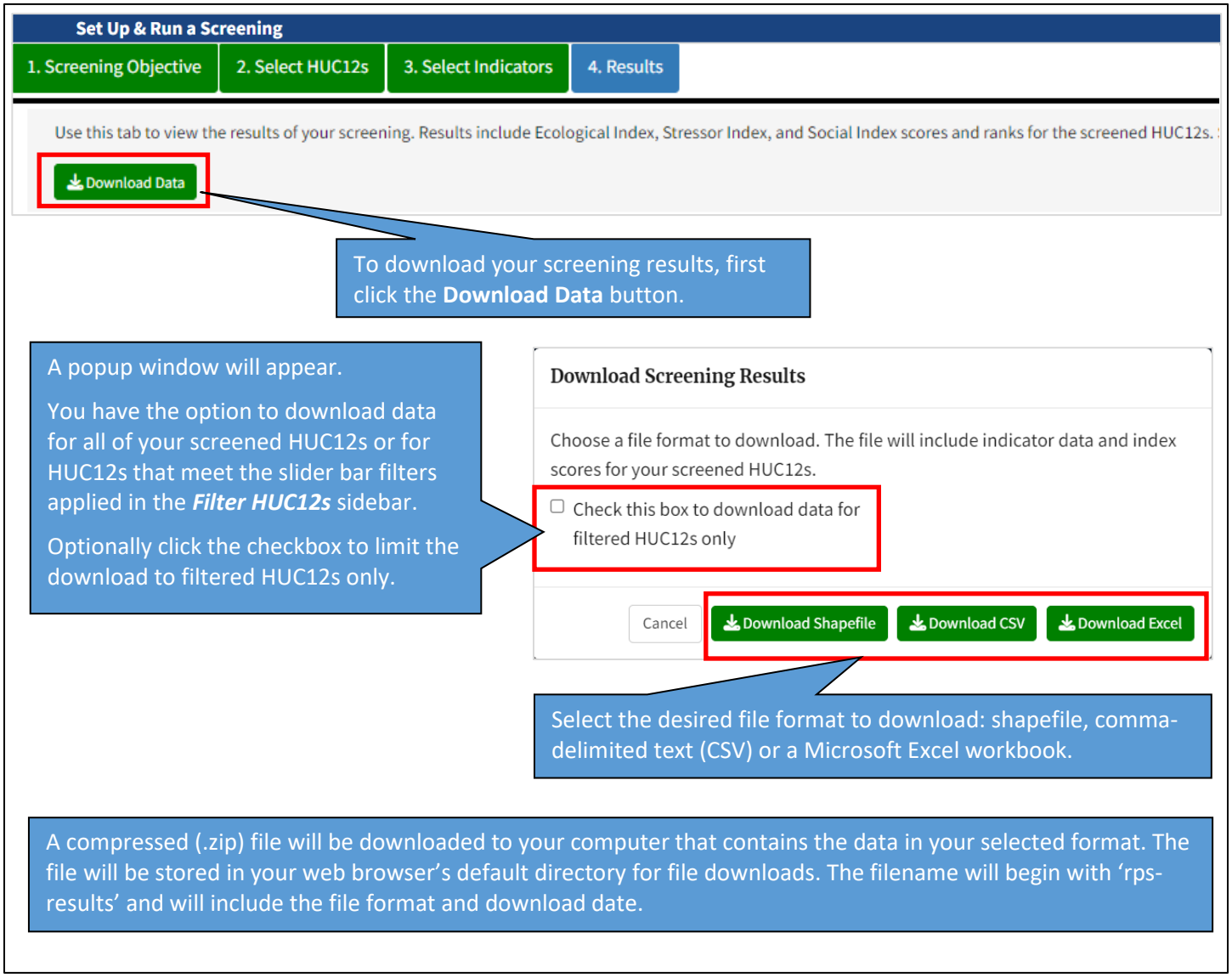
You can add to the group of highlighted HUC12s by clicking on a HUC12 in the map, by clicking on a bubble in the bubble plot or by clicking on a row in the **Screening Results** table.

3 The **Clear Highlighted HUC12s** button will remove all rows from the **Screening Results for Highlighted HUC12s** table. The HUC12s will also be deselected on the ***Map*** and ***Bubble Plot*** subtabs.

4.6.6. Download Data

The **Download Data** button can be clicked at any time when using the ***Results*** tab to download a file containing indicator data and index scores for the HUC12s included in your screening. Screening results can be downloaded in shapefile, Microsoft Excel or comma-separated text file format.

The files generated by the **Download Data** button are provided to allow users to perform additional analysis and mapping using other software. *The files cannot be loaded into the RPS Tool at a later time*. To store a copy of your screening in a file format that can be loaded into the RPS Tool, use the **Save Screening** button instead. See Section 4.2 (*Save Screening*) for instructions on how to use the **Save Screening** button.

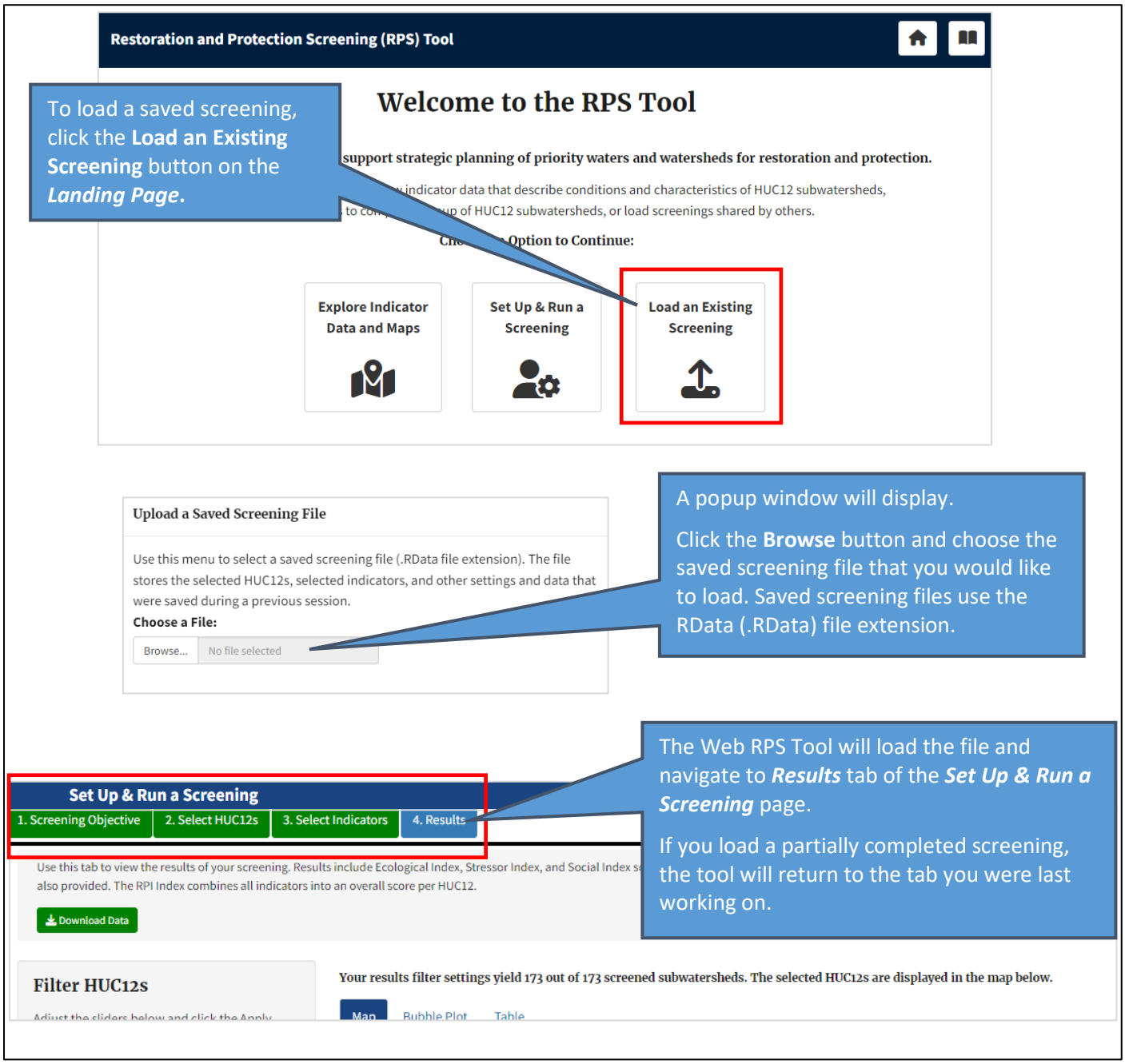


5. Load an Existing Screening

The **Load an Existing Screening** button on the ***Landing Page*** enables users to load a saved screening into the Web RPS Tool. A saved screening can be loaded into the Web RPS Tool to:

- Continue working on a partially completed screening.
- Review the results of an existing screening.
- Adjust the settings of an existing screening.
- View the results of a screening shared by others.

Refer to Section 4.2 (*Save Screening*) for instructions on how to save a screening while using the ***Set up & Run a Screening*** page.



Appendix A. RPS Index Score Calculation Methods

The Web RPS Tool calculates index scores using the steps described below. The index calculation methods used in the Web RPS Tool are the same as methods used in the Excel RPS Tool.

Step 1. Normalize Indicator Values

$$Ind\ Norm_i = \frac{(Ind_i - Ind_{Min})}{(Ind_{Max} - Ind_{Min})}$$

- *Ind Norm$_i$* is the normalized indicator value for HUC12 "i".
- *Ind$_i$* is the raw indicator value for HUC12 "i".
- *Ind$_{Min}$* is the minimum indicator value among screened HUC12s. For indicators with outlier adjustment applied on the ***Weights and Settings*** subtab, *Ind$_{Min}$* is set to the 1st percentile indicator value instead of the minimum.
- *Ind$_{Max}$* is the maximum indicator value among screened HUC12s. For indicators with outlier adjustment applied on the ***Weights and Settings*** subtab, *Ind$_{Max}$* is set to the 99th percentile indicator value instead of the maximum.
- If *Ind$_{Min}$ = Ind$_{Max}$* then all HUC12s have the same indicator value and *Ind Norm$_i$* is set to 0.5 for all screened HUC12s.
- If *Ind$_i$* is blank/missing then also set *Ind Norm$_i$* to blank.
- If *Ind Norm$_i$* is less than zero for any HUC12s due to outlier adjustment, set *Ind Norm$_i$* equal to zero for those HUC12s.
- If *Ind Norm$_i$* is greater than one for any HUC12s due to outlier adjustment, set *Ind Norm$_i$* equal to one for those HUC12s.

Step 2. Calculate Ecological, Stressor and Social Index Scores

$$Ecological\ Index_i = \frac{(Ind\ Norm_{1,i} \times Ind\ Weight_1) + (Ind\ Norm_{2,i} \times Ind\ Weight_2) + (Ind\ Norm_{3,i} \times Ind\ Weight_3) + \ \ldots}{(Ind\ Weight_1 + Ind\ Weight_2 + Ind\ Weight_3 + \ \ldots)}$$

- *Ecological Index$_i$* is the Ecological Index score for HUC12 "i".
- *Ind Norm$_{1,i}$* is the normalized value of the first ecological indicator for HUC12 "i" and *Ind Weight$_1$* is the weight of the first ecological indicator.
- *Ind Norm$_{2,i}$* is the normalized value of the second ecological indicator for HUC12 "i" and *Ind Weight$_2$* is the weight of the second ecological indicator.
- *Ind Norm$_{3,i}$* is the normalized value of the third ecological indicator for HUC12 "I" and *Ind Weight$_3$* is the weight of the third ecological indicator.
- Blank normalized indicator values are ignored in the calculation. In other words, index scores are calculated with non-blank indicators only.
- Ecological Index scores are calculated with ecological indicators only.
- Repeat for the Stressor Index with stressor indicators and for the Social Index with social indicators.

Step 3. Calculate Restoration and Protection Integrated (RPI) Index Scores

$$RPI_i = \frac{Ecological\ Index_i + Social\ Index_i + (100 - \ Stressor\ Index_i)}{3}$$

- *RPI$_i$* is the RPI Index score for HUC12 "i".
- *Ecological Index$_i$* is the Ecological Index score for HUC12 "i".
- *Stressor Index$_i$* is the Stressor Index score for HUC12 "i".
- *Social Index$_i$* is the Social Index score for HUC12 "i".

Appendix B. Calculating New Indicators

Purpose

After reviewing lists and definitions of available indicators, RPS users often decide that they have additional data and can compile more indicators that will make their screening results better. Although it can be time-consuming to compile additional indicators, local or state-specific data sources often include key parameters (such as bioassessment datasets) that haven't been possible to compile nationally. It can be well worth the effort to compile new indicators if they can fill information gaps or add significant value to the quality of watershed comparison results. This appendix can help RPS users ensure that new indicators will be properly formatted and fully usable along with existing RPS indicator data.

Conceptualizing an Indicator Need: What Gap Might It Fill?

After reviewing all the sources of existing indicator data and the subcategories of information recommended under the ecological, stressor and social categories, unfilled subcategory gaps are commonly evident. Often this doesn't imply that the data are non-existent, but rather that the data for some indicator categories is available on statewide or watershed scales but spotty in coverage nationally. Biotic community data and social context data are good examples of data that are available in many states but are impractical to consistently measure nationally. A close look at the purpose for the planned screening, along with reviewing all the indicator subcategories and what is already available in each, should verify what new indicators may be worth the effort to compile.

Consistency: Will New and Existing Indicator Data Be Fully Compatible?

The answer to this question depends on several things. A new data source, first of all, must cover the entire project area in question and contain data that is finely grained enough spatially to be expressed as a watershed attribute at the same scale as the rest of your watershed indicators (e.g., as a measured attribute per HUC12). Second, it would be best if the distribution of the new data is spatially dense enough that it will generate indicator values for most if not all of the watersheds in your screening (some 'no value' blanks are acceptable). Third, new data already compiled on a watershed basis must match not just the watershed (e.g., HUC) scale but the version of the watershed boundary dataset used for all your indicators. Watershed indicator data from the RPS Indicator Database or the EPA EnviroAtlas all use the same version of the national HUC12 geospatial "snapshot" dataset as a common standard. Note that the official national download site for the Watershed Boundary Dataset managed by the US Geological Survey allows the data to be changed by state data stewards on an ongoing basis, which results in inconsistencies with the snapshot standard used by the above-named projects. In summary, all of these factors should be checked to ensure full consistency with other RPS data before investing the effort required to compile a new indicator.

Calculation: Is It Measurable?

Even when it would appear valuable topically to a watershed comparison effort, information in a raw data source is often not in the ideal form to be used meaningfully. This is what makes indicator design and development necessary – transforming related data into usable data. For example, mapped information on stream patterns contains valuable but unusable information, unless functionally important attributes such as mean sinuosity are measured so that channelized, highly altered stream mileage can be contrasted with other, more natural stream forms. Further, as RPS compares watersheds, a measurable attribute must be reasonably suited to being expressed as a watershed attribute. The measurement also needs to be not just mechanically feasible but pertinent to the watershed screening and comparison purpose. Good indicators are developed when quality data sources are not just measurable, but measurable in relevant ways.

Indicator Spatial Scale: Local Versus Cumulative Values

For all indicators, users should be aware of whether the indicator value represents local or cumulative conditions. This can have a strong influence on screening results. The distinction between local and cumulative is due to the fact that most commonly used watershed units, such as the Hydrologic Unit Codes (HUCs) that have been delineated at several scales across the country, are partial rather than whole watersheds. In other words, a HUC may be a drainage area that has other upstream HUCs draining into it, or it may be a true watershed in the headwaters with nothing else draining into it. It would have been impossible to map the HUC units across the nation at several useful scales (with similarly sized watershed units

in each) without mapping many HUCs that have additional watersheds upstream. For this reason, an indicator value for a specific HUC may represent either the measured characteristic only within the HUC (i.e., a local indicator) or the accumulation of the characteristic throughout the HUC plus all its upstream HUCs (i.e., a cumulative indicator, which sums the characteristic through its whole watershed). Only in the case of true headwaters HUCs will the local and cumulative versions of an indicator be identical. Local indicator datasets are far more common than cumulative datasets. If only local data are available but cumulative values are also desired, cumulative values can be calculated from local data where flow routing relationships among the units are known. In the case of HUC12s, about 50% from the lower 48 states are actually true watersheds whereas the other half receive flow from additional HUC12s up-gradient from them.

Directionality: What Does the Indicator's Gradient of Values Mean?

This question relates again to indicator use in specific RPS categories, as well as developing the calculation method. Indicator scores in each of the ecological, stressor and social context classes need to be directionally consistent within-category for the multi-metric indices to also be directionally consistent. All ecological indicator scores are aligned so that higher values imply better condition or recovery potential and social scores are also aligned so that higher is better. Stressor indicator scores, as most users would intuitively expect, are aligned to have a higher score associated with more impacts and lower recovery potential. However, source data may sometimes be in an opposite directional gradient of values than the indicator category must consistently have for its index to make sense. In such cases, it may be necessary to invert the order of the numerical raw scores of an indicator (for example, an ecological indicator like % highly erodible soils, whose higher values are associated with lower restorability) to align it with the other indicators of the same category (see Appendix B for instructions on how to invert indicator data). Errors in directionality are one of the more common pitfalls in new indicator development and can have substantial negative effects on screening results.

Validation: Does the Indicator Measure What's Intended?

Rarely does an indicator measure directly and exactly what would be ideal. Thus, indicators typically vary as to how well they approximate the watershed attribute they purport to measure. Although all of the principles discussed above can help improve the quality and usefulness of an indicator, testing the end result against known data is a necessary QA/QC element of indicator compilation. Quality control procedures should be part of the indicator compilation and data table development steps. It is especially important for your QA/QC process to detect indicators that are not directionally aligned (e.g., when watersheds strongly expected to score high turn out low) and guard against data transfer errors in which an entire indicator's values may be incorrect due to faulty calculation, miscopying or mislabeling. These two types of error can skew the results substantially but are relatively easy to find through diligent QC before they do their damage.

Your evaluation procedures should also examine each indicator's set of values in comparison to reference sites of known quality, including healthy as well as impaired waters or watersheds. One commonly used approach involves spot-checking sample watersheds by manually checking raw values where watershed conditions related to the indicator are well-known, particularly if examples of what should be high and low scoring watersheds are available. For each indicator's measured set of values, observe whether the indicator performed as expected with regard to these sites. For example, did a high percentage of healthy reference sites score in the top quartile for a specific ecological indicator? If healthy reference site scores were low, the indicator might have been incorrectly scored.

Compilation: Add a New Indicator to an Excel RPS Tool

Ultimately, development of a new indicator for addition to an existing Excel RPS Tool boils down to a few key products, the main one being quality-assured, watershed-specific values for that indicator for all (or most of) the watersheds of interest. These results should be compiled in a data table organized by watershed ID and capable of being sorted into the identical order and total watershed number found in the Excel RPS Tool to which they will be added. Metadata standards for geospatial data should also be compiled, especially a brief indicator name and descriptive definition including what has been measured, data source and date. The new names and descriptions should always be added to the ***Indicator Info*** tab of the Excel RPS Tool. Instructions for adding indicators and their data are found on the ***Custom Indicators*** tab of the Excel RPS Tool. Finer details on adding new indicators are available in Section 14 (*Custom Indicators Worksheet*) of this user guide.

RPS Indicator Scoring Techniques

There are usually multiple ways to measure a watershed attribute when a new indicator is being developed. This section describes several of the common ways in which different indicators can scored.

Continuous Values

The indicator can have any numerical value along a gradient of possible values (Examples: 3,212.4 acres of protected riparian buffer; 32% highly erodible soils in the watershed). This scoring approach is important when useful to know the differences in magnitude among different entities the indicator is comparing. Most recovery potential indicators are scored in this manner.

Rank Ordering

The raw, continuous value of the indicator is used to arrange the entities from highest to lowest and give each a rank number (Examples: 15th highest bioassessment score; smallest watershed size). This method still provides comparisons among entities but the magnitude of differences among ranks is unknown and may involve abrupt or gradual changes.

Intervals

Ranges of indicator value are established and all members within the same interval have the same score (Examples: Percent protected land in 25% increments based on land measurement; number of impairment causes in 25% increments based on quartering the rank-ordered list of waters). This method trades off detail for simplicity, but can be appropriate when all members of each interval can be legitimately generalized to the same value. Intervals may be equal in value ranges or numbers of members or may be unequal but based on natural breaks in the range of values.

Thresholds

This approach combines continuous and interval valuing concepts and involves scoring continuously on one side of a threshold value while assigning a simplified, single value to entities on the other side of the threshold (Example: use actual % of impervious cover below 14%, assigning a uniform value of 1 if above 14%).

Absolute Value Scoring

Some characteristics may have a key target value most meaningful for recovery potential somewhere in the mid-range of values instead of at the maximum or minimum. Values closest to a target value on either side are desirable and greater distance to either side diminishes the value (Example: nearness to a numeric water quality criterion - waters barely failing the criterion have greater recovery potential than waters severely below the criterion and threatened waters barely achieving the criterion are of greater priority for restoration than unthreatened waters well above the criterion). Using the mathematical concept of absolute value enables such situations to be scored by calculating the absolute value of the target value minus the individual water's value.

Binary Values

The indicator scoring has just two values, 1 or 0. This type of scoring reflects simple presence or absence of a recovery-relevant characteristic (Examples: existence of a TMDL or watershed plan; presence/absence of a target fish species being assessed). When this indicator type is being developed, special care should go into deciding whether a watershed with no reported presence of the indicator trait is truly its absence (which might justify the score of 0 for those watersheds) or merely lack of evidence about presence (which is properly expressed by leaving the value blank for those watersheds).

Ordered Categorical Variables

This approach starts with non-numeric categories and assigning them in sequence of importance according to a stated criterion (Example: assigning urban dominated, agriculture-dominated and forest-dominated subwatersheds different category values based on general restoration cost and complexity). The method enables coarse consideration of non-numeric concepts that may significantly affect recovery, but if used, assignment of relative value differences should be reasonably supportable.