# The Watershed Index Online

## Quick Users Guide
## (WSIO V1, January 2018)

The WSIO Tool facilitates the download of watershed indicator data from a library of more than 300 popular indicators. Data for these indicators have been pre-processed for all 83,015 HUC12 watersheds in the contiguous United States and is hosted as a map service (https://gispub.epa.gov/arcgis/rest/services/r4/wsio/MapServer). This tool supports the assessment of relative watershed condition by calculating ecological, stressor, and social index values, as well as a combined watershed index (WSI) that considers all three components.

For more detailed instructions and background information, please consult the Full WSIO User Manual and other materials at the Watershed Index Online website (https://www.epa.gov/wsio).

**Disclaimer and User Requirements**

- **Software requirements:** At least a Windows 7 operating system and Microsoft .NET Framework 4.5 and above. Mention of product names does not denote endorsement by the EPA.
- **The WSIO is intended to be used as a decision-support tool** by government, professional, academic, and community users with a basic understanding of how the ecological condition of a watershed and the stressors that act upon it can affect hydrology, biology, and water quality. The WSIO data and tool outputs do not represent, change or substitute for any statute, regulation, policy, EPA decision or position.
- **It is the responsibility of the user to read and evaluate dataset limitations, restrictions, and intended use.** To the best of our knowledge, the data, information, and supporting materials on the WSIO website are accurate; however, no warranty expressed or implied is made regarding the accuracy or utility of the data for general or scientific purposes, nor shall the distribution constitute any such warranty. All modeled geographic data are, by their nature, imperfect. The data provided by this tool shall not be taken as absolute truth, but rather as an approximation made in good faith based on the best available data.
- **For site-specific data, WSIO data will not replace "boots-on-the-ground" measurements or local knowledge.** Better local data may be available from local sources.
- **Neither the EPA, EPA contractors, nor any other organizations cooperating with the EPA assume any responsibility for damages or other liabilities** related to the accuracy, availability, use or misuse of the information provided on this website. The EPA reserves the right to change information at any time without public notice. Any errors or omissions should be reported to the WSIO team using "Contact Us" on the WSIO website. We are always happy to hear your feedback and use that feedback for future enhancements.

# Contents


1. RUN WSIO Tool and Select Data Source ..... 5

2. Build or Open a Project ..... 5

A. A new project ..... 5

B. Open an existing project ..... 5

C. Build a user database of indicators ..... 5

3. WSIO Project Description and Select Geography ..... 6

4. Save your Project ..... 6

5. Finalize HUC Selection ..... 6

A. Map window hints ..... 7

i. Navigation menu ..... 7

ii. Identify ..... 7

iii. Map labeling ..... 8

iv. Add a basemap ..... 9

v. Set basemap Transparency ..... 9

vi. Select HUCs using the attribute table ..... 10

6. Select Ecological, Stressor and Social Indicators ..... 11

A. Indicator selection helpful hints ..... 12

i. Indicator definitions ..... 12

ii. To select multiple indicators ..... 12

iii. To remove indicators from selection ..... 12

iv. To remove all indicators from a category selection ..... 12

v. Using a 'Neutral Variable' ..... 12

vi. Applying a weight factor ..... 12

7. WSIO Screening ..... 13

8. Run Indicator Correlations ..... 13

A. Change your indicator selection ..... 14

B. Change your HUC selection ..... 14

9. Run a WSIO Screening ..... 14

10. Map Indicator Scores ..... 16

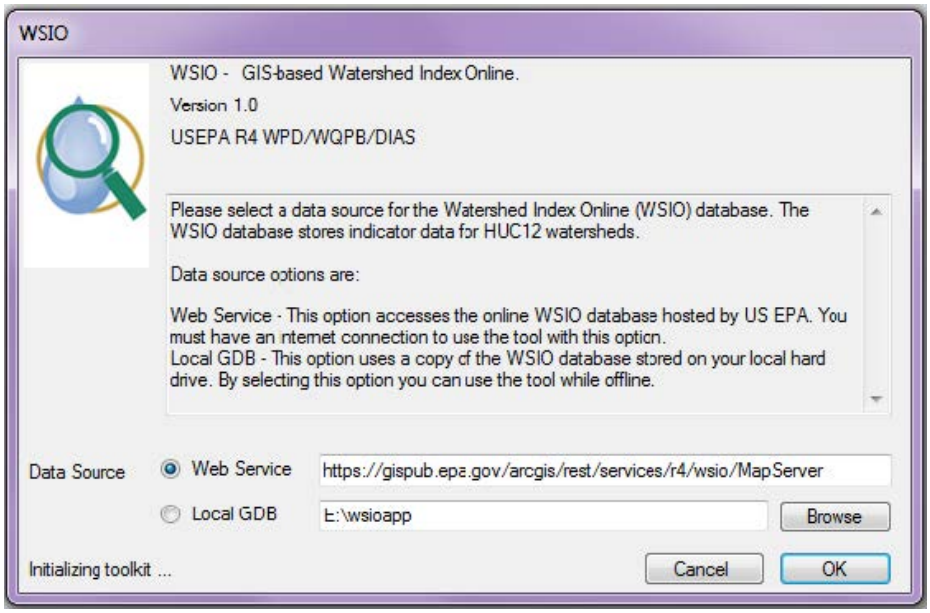
A. Map symbology hints ..... 17

i. Change Map symbology ..... 17
ii. Layer Properties window ..... 17
1. Field ..... 17
2. Change HUC symbology color ..... 17
3. Under Statistics, change the Interval Snap to 'none.' ..... 17
4. Change the Results Categories ..... 17
11. Open an Existing Project ..... 18
A. Save-As ..... 18
12. Build a User Database of Indicators ..... 19

# Quick Guide to using the WSIO app

## 1. RUN WSIO Tool and Select Data Source

Run the WSIO Tool by opening the executable file, '**WSIO.exe**.' The application will open with the option to use a 'Web Service' or a 'Local Geodatabase' to pull in indicators to the tool. The Web Service requires an internet connection for data transmittal. The most current version of these indicators will be available through the Web Service and for download from the WSIO website. If you have downloaded a copy of the indicator geodatabase from the WSIO website, you may wish to choose 'Local GDB' and browse to its location. Once you have selected your data source, click '**OK**.'




## 2. Build or Open a Project

The application will open with a blank workspace. Click on the '**Project**' tab to be able to start a new project, open an existing project, or to build a user database of indicators.

### A. A new project

Click on '**New**' and continue to Section 3

### B. Open an existing project

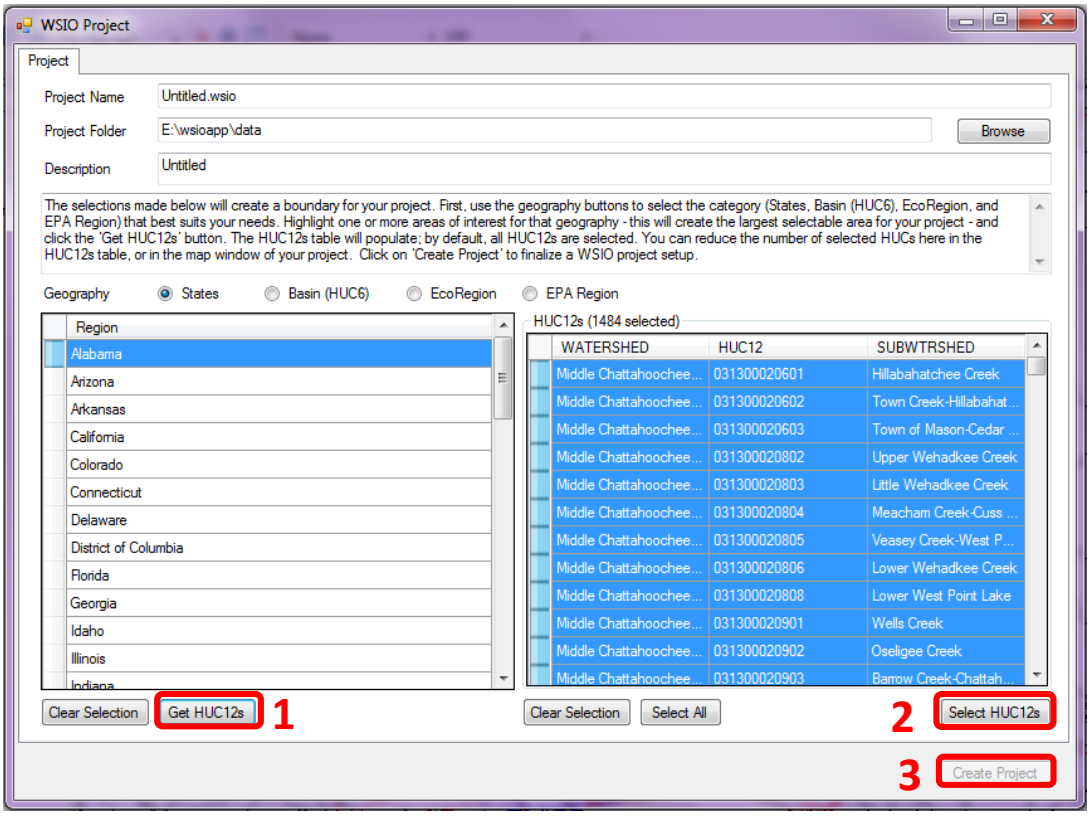
see Section 11

### C. Build a user database of indicators

see Section 12

## 3. WSIO Project Description and Select Geography

A 'Project' window opens for you to name your project, choose where to save it, add a description, and begin to select your geographic area of interest. For 'Geography,' first choose one of the four broad categories provided. The lower left table will populate with selection options. To select more than one State, for example, hold the CTRL button down while making multiple selections. Click **'Get HUC12s'** (**#1**) to complete your selection and populate the lower right table. The selections made below will create a boundary for your project. Further reductions (no additions) to this list can be made and changed when doing screening runs. Once finished with this list click '**Select HUC12s**' (**#2**), then '**Create Project**' (**#3**).



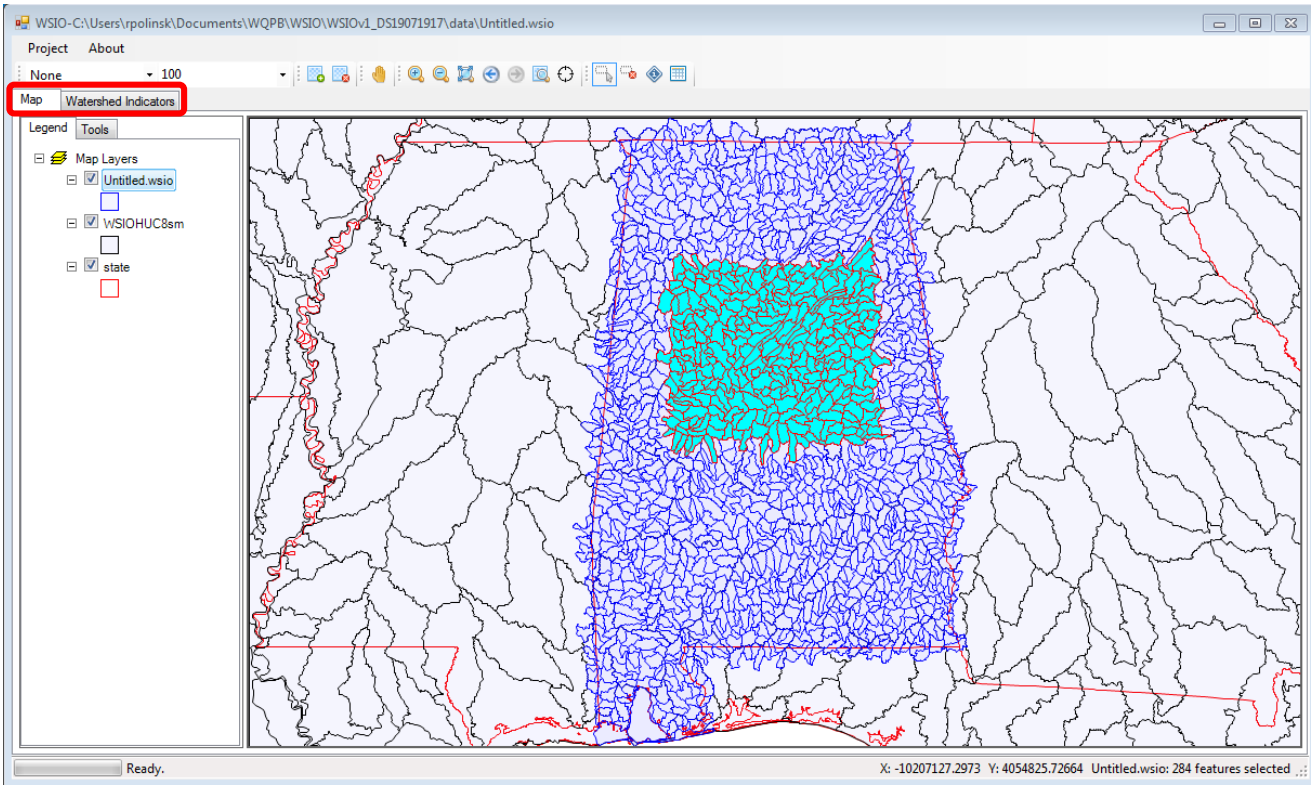

## 4. Save your Project

Save your project often by clicking on '**Project**' in the main header menu, then '**Save**.'

## 5. Finalize HUC Selection

To view or change your selection of HUC12s for a screening run, click on the '**Map**' tab. You are provided with a map of the HUC12s that were selected in the 'Project' window. Selected HUCs will appear shaded in aqua. You are able to add or remove HUCs from selection, as long as they were part of the initial geography. Use the 'Select' icon in the map window and hold down the CTRL button when selecting multiple HUCs on the map or else all other HUC

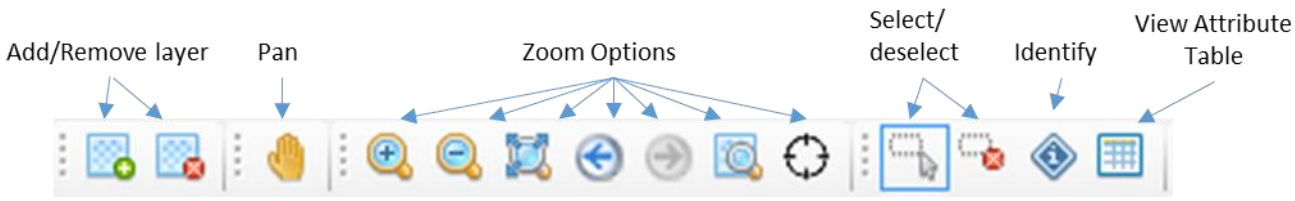
selections will be removed. Once satisfied with your selection of HUC12s, click on the '**Watershed Indicators**' tab. See below for a few map use tips.



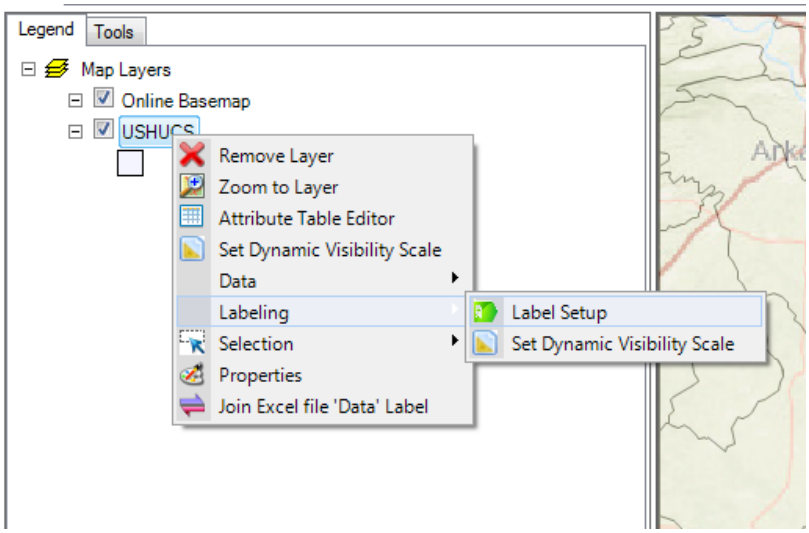

## A. Map window hints

i. Navigation menu Click on the various GIS icons to pan, zoom in and out, make HUC selections, or browse the attribute table of a layer.

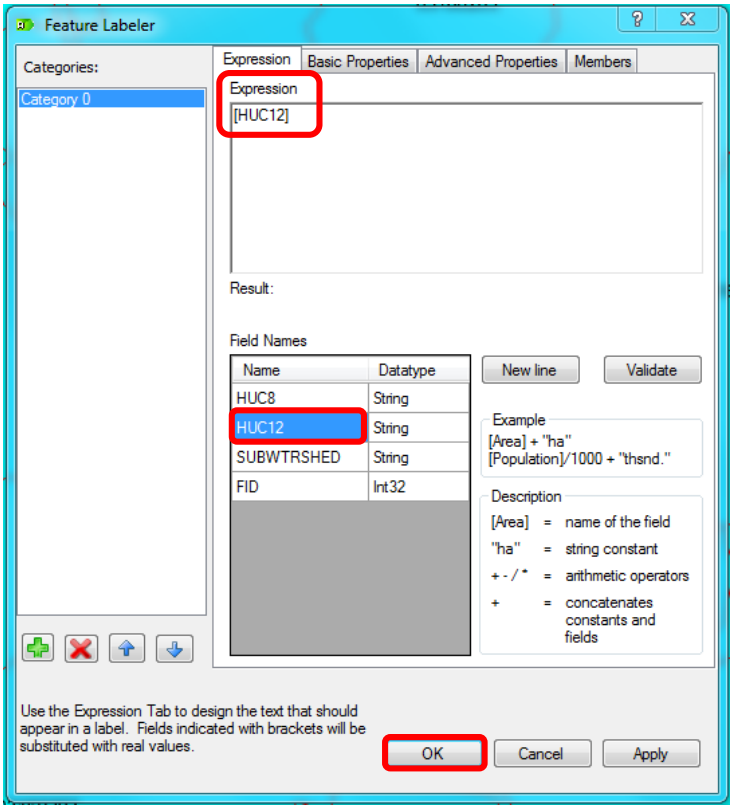
ii. Identify Use the identify tool to see the HUC code. At this time, you have to reselect the Identify tool each time you want to identify a feature. This is something we hope to have fixed in a future version. Map labeling may serve as a good alternative to using this tool.



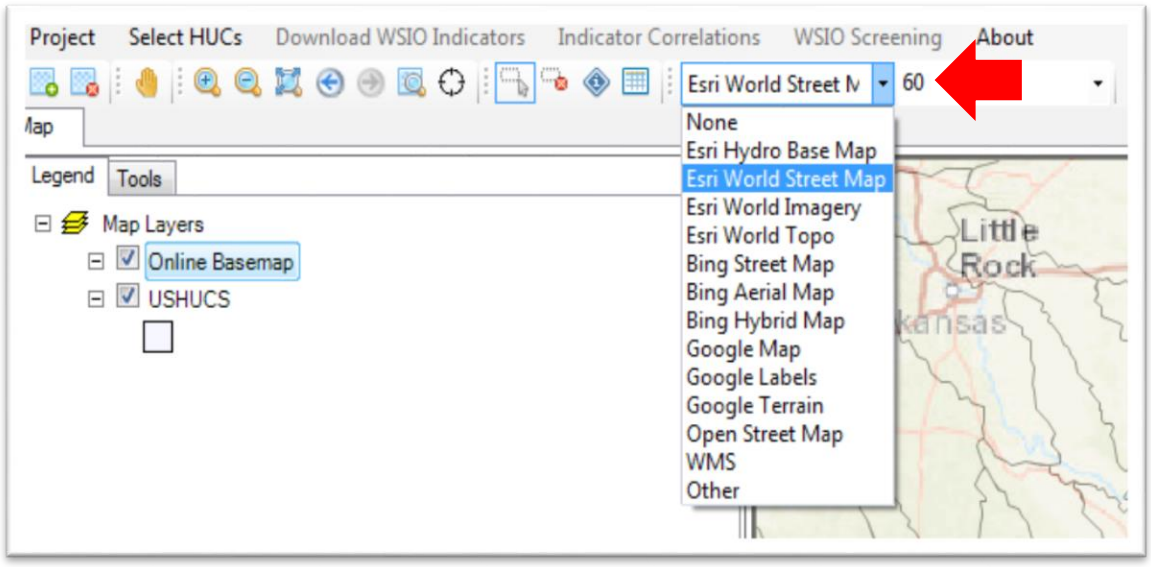
iii. Map labeling Right click on the HUC layer within the legend for additional symbology options. To enable labeling of the layer, click on '**Labeling**,' then '**Label Setup**.'



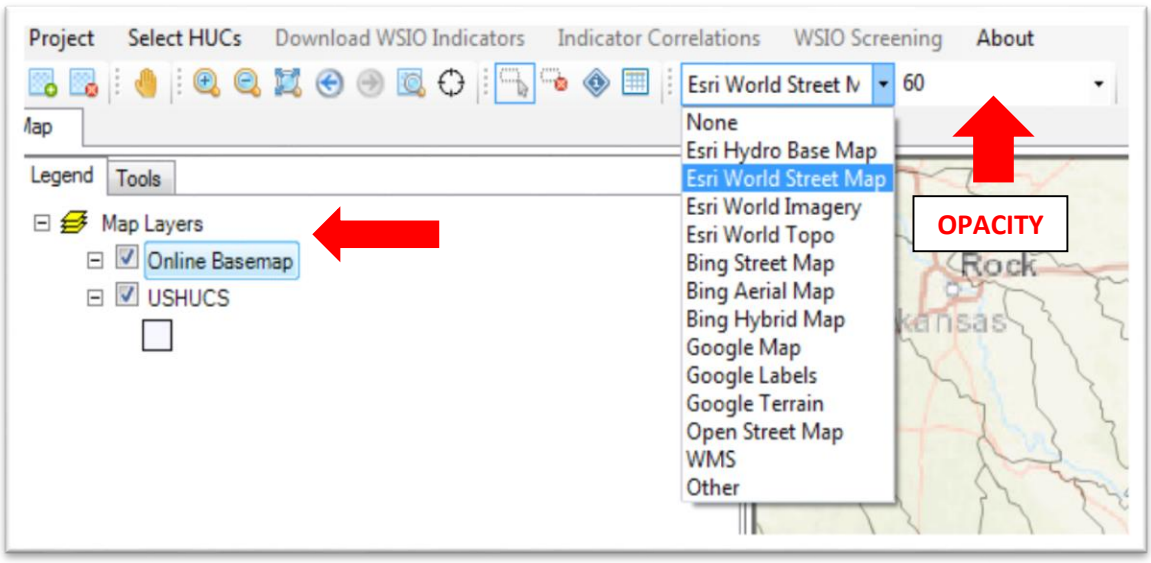

In the window that appears, you can select the field you want to label. In this example, 'HUC12' was selected and it appears in the 'Expression' window. Click '**OK**.' This may be a good alternative step to identify HUCs, rather than using the Identify tool.



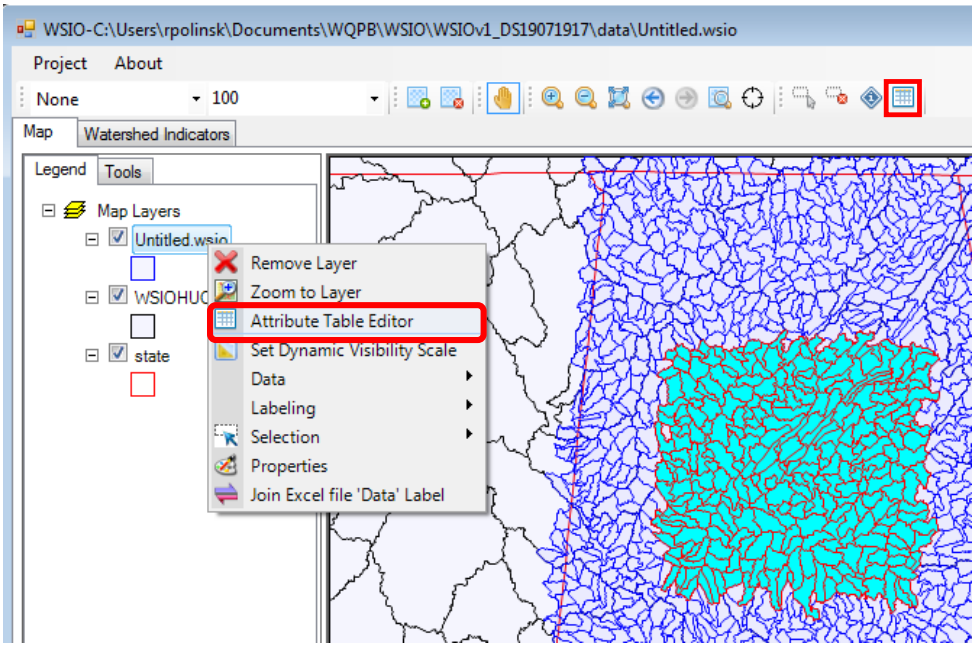
iv. Add a basemap Click on the list in the navigation menu and choose your desired basemap.

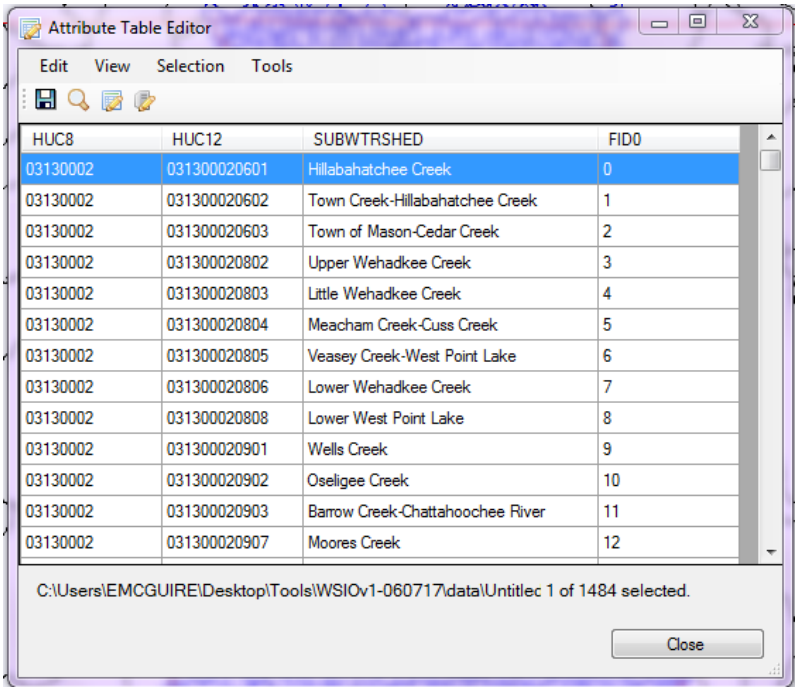



v. Set basemap Transparency With the basemap selected, click on the opacity dropdown list to select the level of transparency desired.

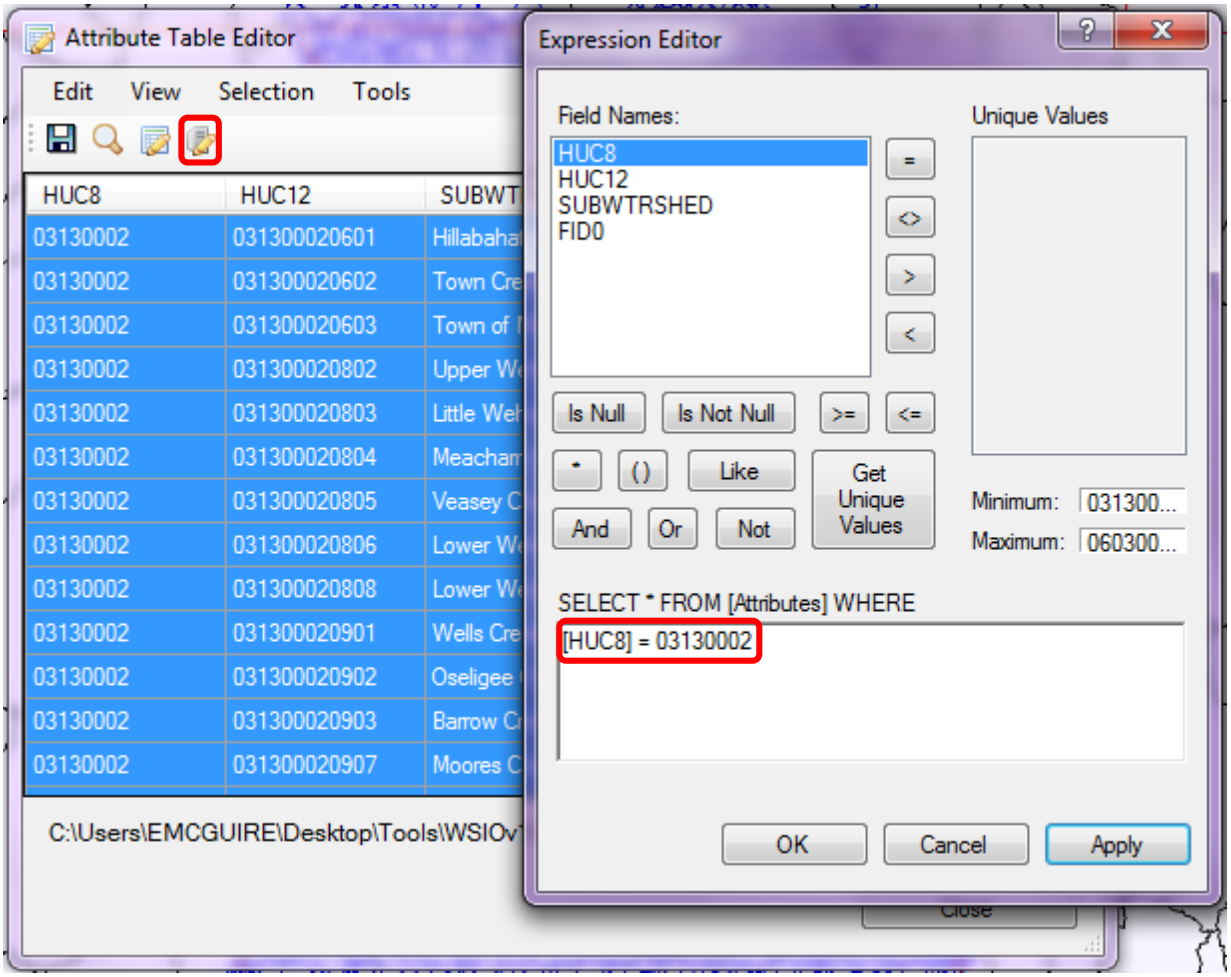


vi. Select HUCs using the attribute table ***Warning** When you open the Attribute Table, the HUC12 Selections that have been made will be unselected. This is something we are hoping to fix in a future version.* Right click on the HUC12 layer in the Legend and select '**Attribute Table Editor,**' or, open the attribute table using the icon located in the tool bar along the top of the map. Select the HUC12s for your project by holding the CTRL button, or select everything between two HUC12s by using the Shift key. Using the Attribute Table is the best way to select all the HUC12s within a HUC8 or HUC10 watershed.



1. You can search the Attribute Table using a query to select all the HUC12s within a HUC8 watershed. Click on '**Query**' in the menu bar to open the '**Expression Editor**' window. You can create an equation to easily find your HUCs of interest, like the example below, where all HUC12s within the HUC8 03130002 were selected.




## 6. Select Ecological, Stressor and Social Indicators

Click the '**Watershed Indicators**' tab. The window opens to three lists of indicators available for selection; they are grouped by Ecological, Stressor, and Social categories. From the list of WSIO Indicators, select the indicators you would like to process by clicking on rows of the grid while holding down the CTRL key. When you have at least one indicator from each category selected, you will see the Selected Indicators box populate with your choices. Once you have completed your indicator selections, click on the upper left navigation menu '**WSIO Screening**' to download the corresponding indicator data from the map service.

## A. Indicator selection helpful hints

i. Indicator definitions Located in the lower right when your mouse hovers over an indicator on the left.

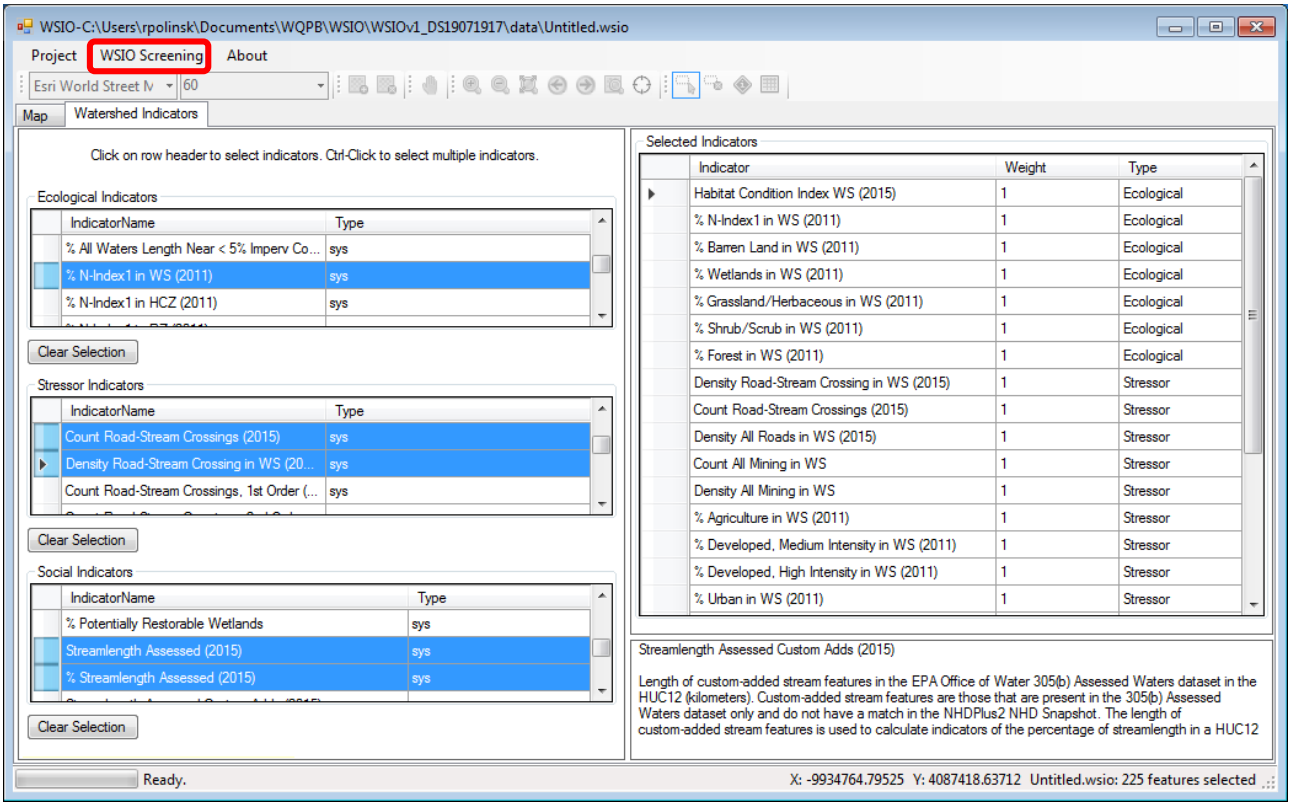
ii. To select multiple indicators CTRL-click left mouse button on each indicator

iii. To remove indicators from selection Find that indicator in the left selection boxes and using CTRL-left click together, click on the indicator to remove it from the right 'Selected Indicators' box.

iv. To remove all indicators from a category selection There is a 'Clear Selection' button under each indicator category grouping. Click this and all indicators that have been selected will be removed.

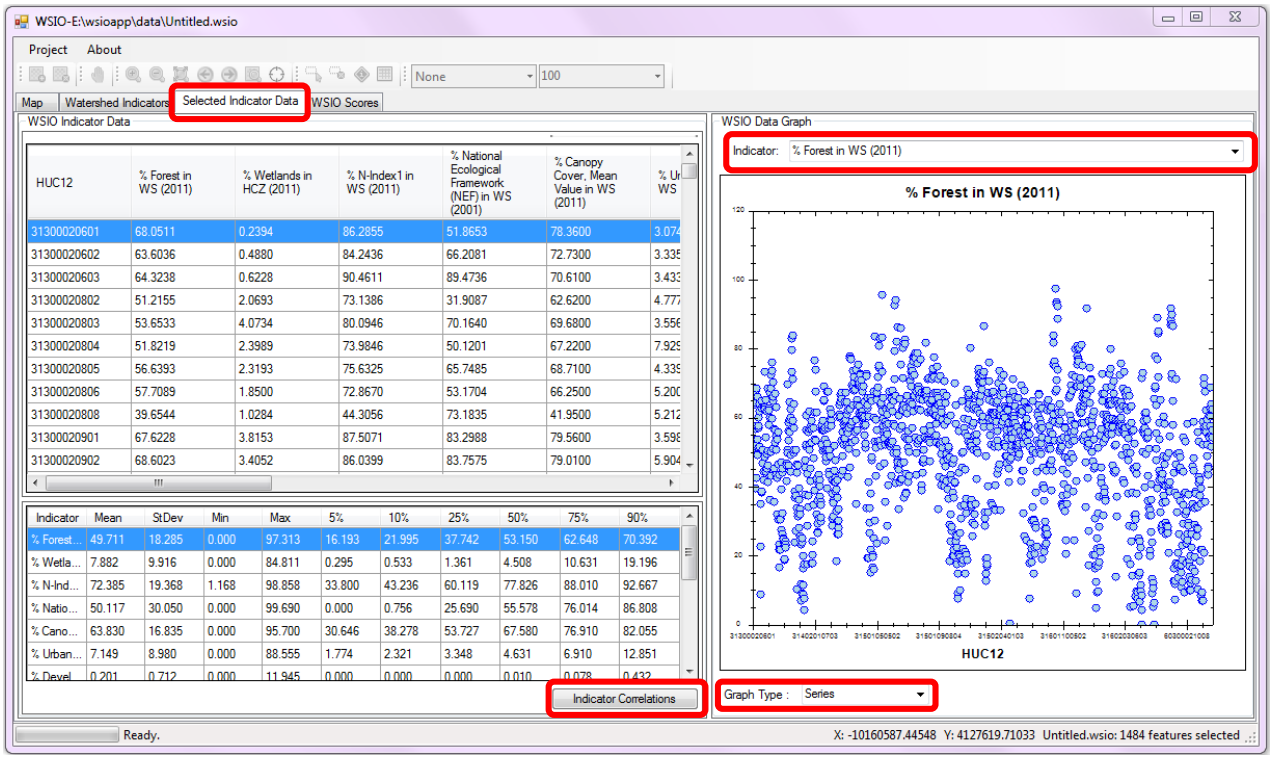
v. Using a 'Neutral Variable' The last indicator in each list is called a '**neutral variable**.' Use this when you do not wish to select any indicators in a certain category.

vi. Applying a weight factor You can also apply a weight factor to indicators within the table to the right.



## 7. WSIO Screening

The tool runs and calculates the indicator scores for each HUC. Four tabs are now displayed: 'Map', 'Watershed Indicators', 'Selected Indicator Data', and 'WSIO Scores'. The '**Selected Indicator Data**' tab shows indicator data (upper left box), summary statistics (lower left box) and a graph of the indicator data (right side). This information is displayed here so you can familiarize yourself with the data that has been pulled in to your project. Users can select from the dropdown list above the graph to select an indicator to plot (**HINT:** highlight the list then use mouse wheel to scroll). You can also change the graph type between 'Series' and 'Probability' in the dropdown under the graph. The Series option will graph the HUC on the x-axis and the indicator value on the y-axis (upper table). Click on a point to see the HUC code and watershed name displayed at the bottom of the graph. The Probability option will graph the lower table where the probability is on the x-axis and the percentage of the indicator is on the y-axis. Next, click the '**Indicator Correlations**' button below the summary statistics table.

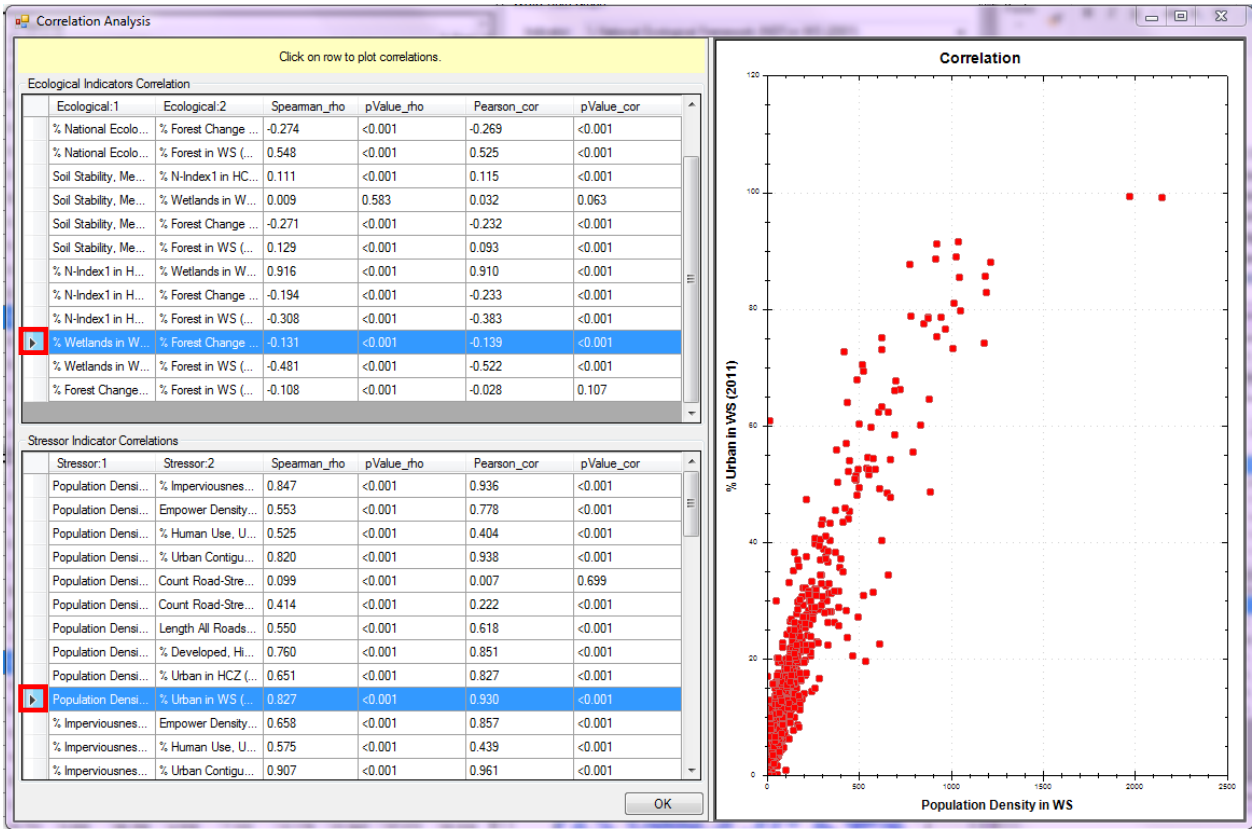



## 8. Run Indicator Correlations

This is an optional, but important step that has been provided to help in the selection of Ecological and Stressor indicators. The tables provided on the left are separated by indicator type. They provide correlation information on all the indicators you have selected. Click on a row to see the data graphed. You can use this information to see, for example, if two indicators are highly correlated or not; and then decide if both are needed in your WSIO project. The selection of indicators should be a very thoughtful process, and will likely require some trial and error.

A. Change your indicator selection Return to the '**Watershed Indicators**' tab and change the indicator selections that are highlighted. Only selected indicators will be included in the WSIO screening and calculations. Click on '**WSIO Screening**.'

B. Change your HUC selection Return to the '**Map**' tab and change the HUC selections that are highlighted either by selecting them directly on the map or using the attribute table. Only selected HUCs will be included in the WSIO screening and calculations. Return to the '**Watershed Indicators**' tab and make any indicator adjustments, then click '**WSIO Screening**.'




## 9. Run a WSIO Screening

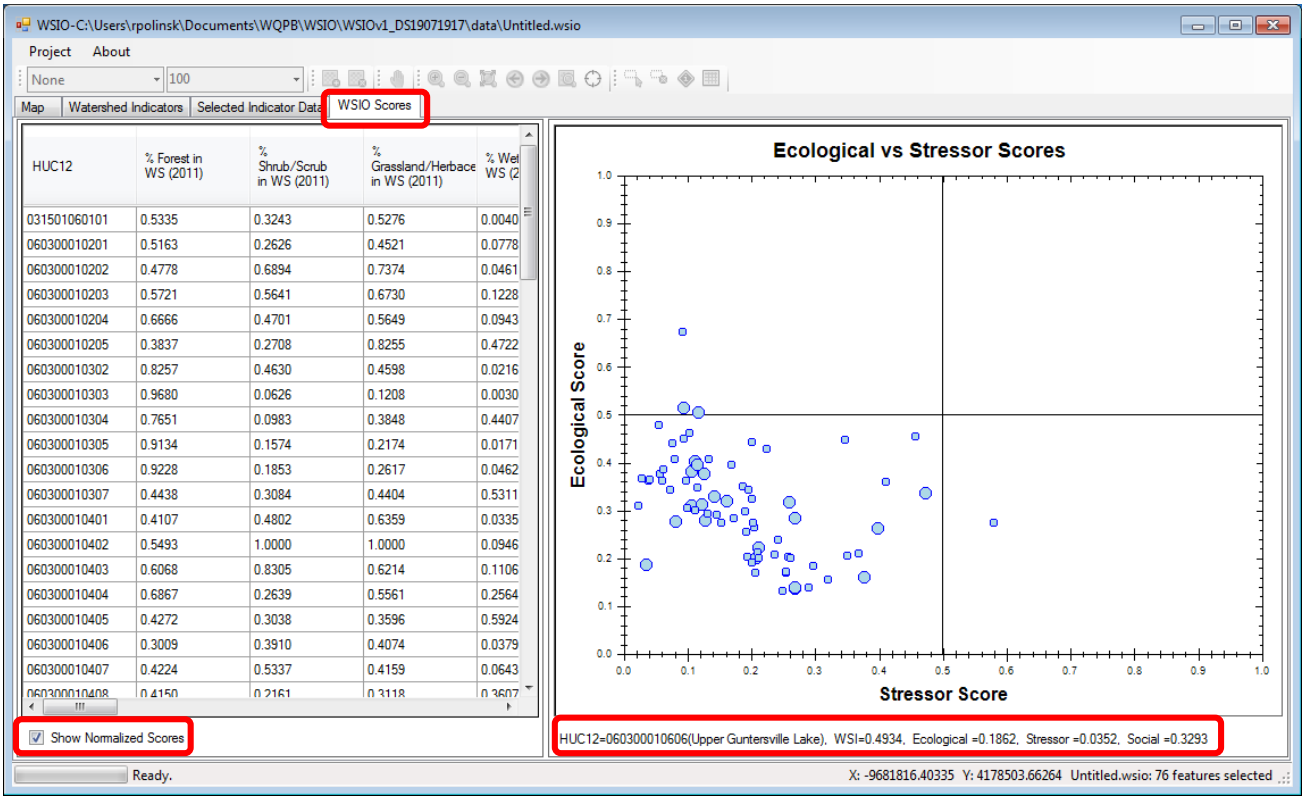
With your desired indicators and HUCs selected, click on '**WSIO Screening**' in the upper menu bar. The 'Map' tab opens displaying the WSI Scores for each HUC. The mapped values/attributes can be changed by using the drop down menu along the top of the map. After exploring the map, click on the 'WSIO Scores' tab. The graph shows the plot of the Ecological Scores and the Stressor Scores for the set of HUC12s selected. The upper left quadrant of the plot shows HUC12s with high ecological scores and low stressor scores. WSIO uses a min-max normalized scoring for each indicator. Normalization using the minimum and maximum value of the indicator is equivalent to the assumption of an empirical uniform distribution. Results are displayed in a table and a bubble

plot. The Stressor score is on the x-axis, the Ecological score on the y-axis, and the Social score is represented with bubble size. The lines in the middle of the graph represent the median values.

A. Results can also be seen beneath the bubble plot when you click on a bubble.

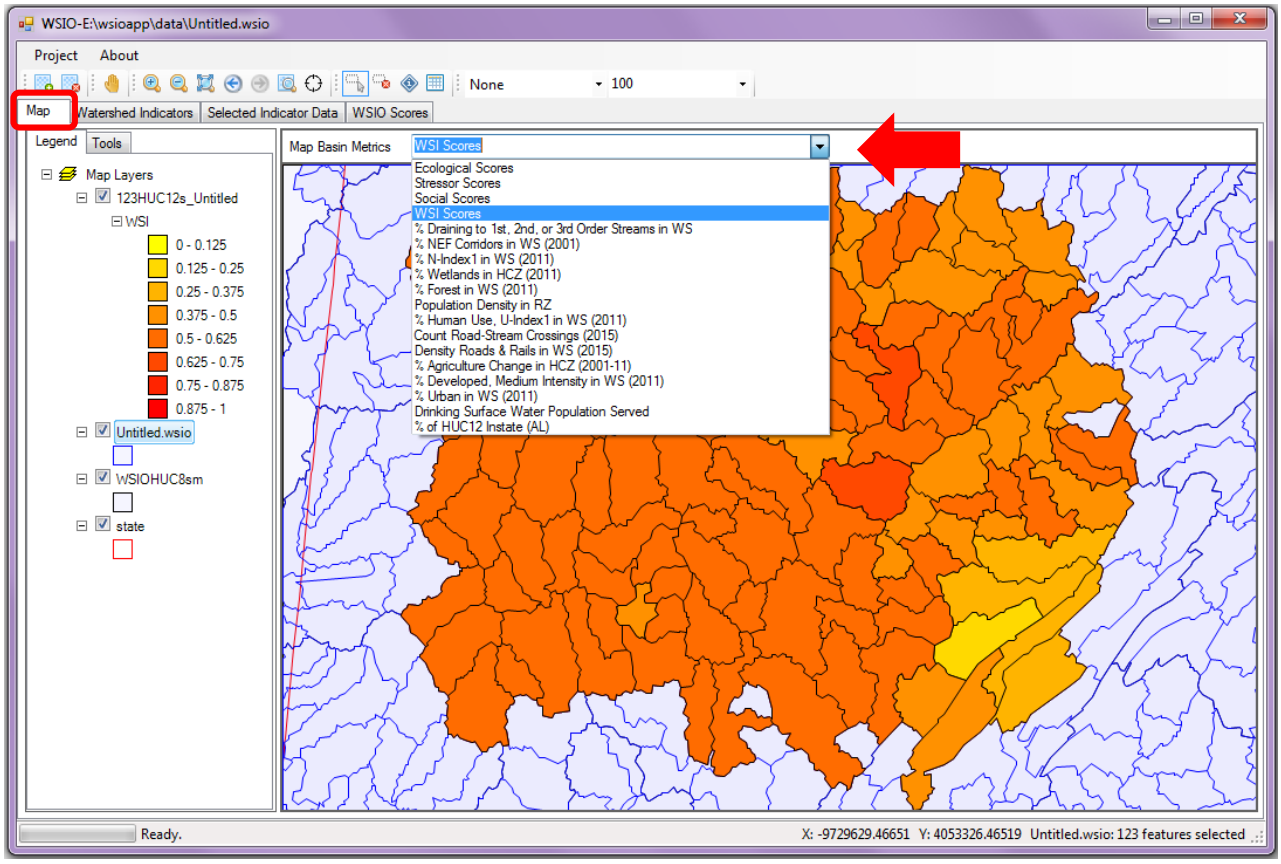
B. Click on '**Show Normalized Scores**,' in the lower left, to display the summary Indicator Scores in the grid.

C. **Tip:** You can highlight the WSIO Scores Table, then press CTRL-C and paste the results into a spreadsheet.



## 10. Map Indicator Scores

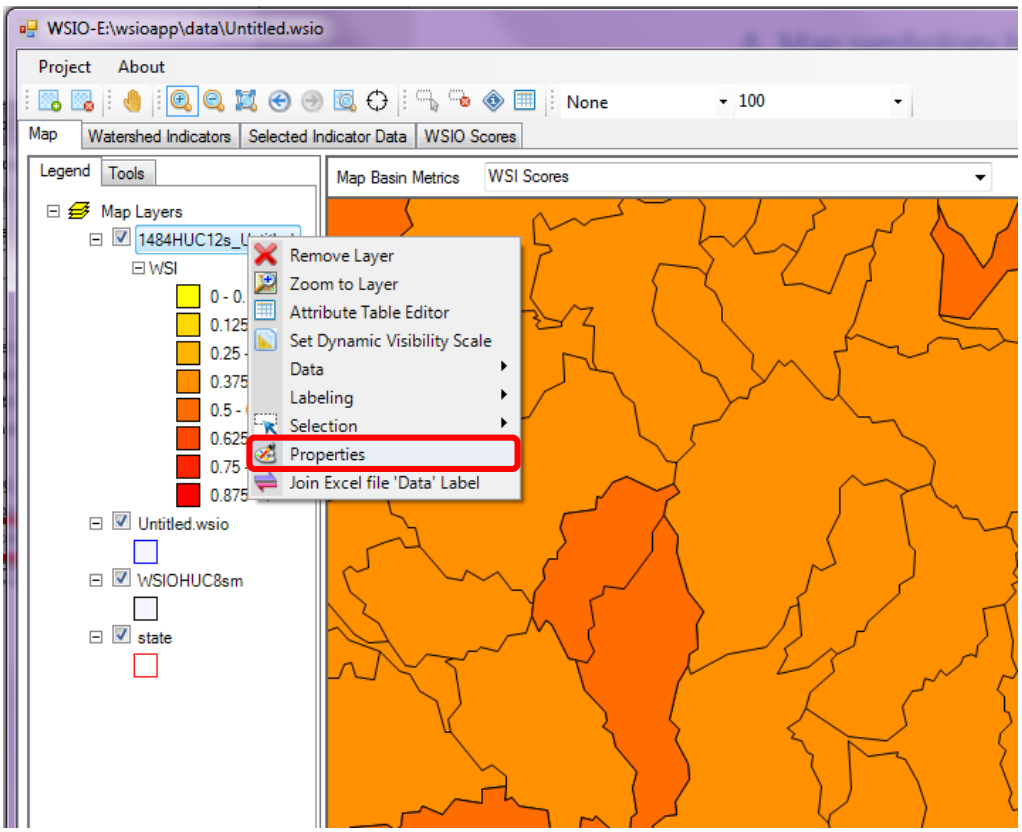
Click on the '**Map'** tab in the menu bar to display a thematic map of the indicator scores. Select from the Map Basin Metrics dropdown list located along the top of the map to select an indicator or score to map. See below for some map symbology and use hints.



## A. Map symbology hints

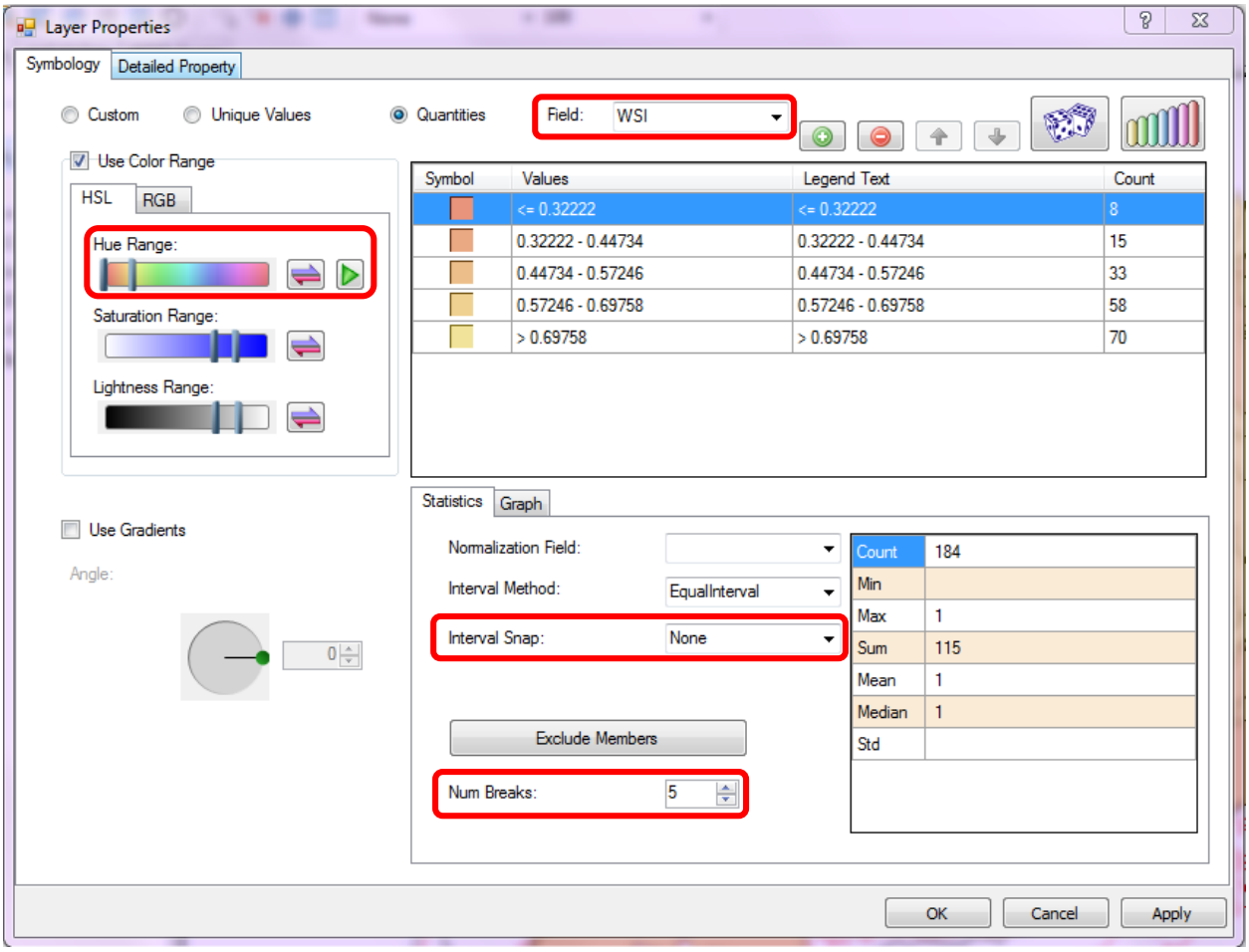
### i. Change Map symbology

Right click on the HUC layer in the legend and select '**Properties**.' The 'Layer Properties' window will open allowing you to make changes to the map symbology.




### ii. Layer Properties window

1. Field In this dropdown, choose the indicator or score you would like to symbolize.
2. Change HUC symbology color Use the '**Hue Range**' to change the color gradient of the scores. Move the sliders for a smaller range of colors.
3. Under Statistics, change the Interval Snap to 'none.' This will populate the Legend Text to provide a range of values.
4. Change the Results Categories Under Statistics, change the 'Num Breaks' value to change the number of results categories. You can view these breaks by clicking on the 'Graph' tab.
5. Click '**Apply**' when complete.




## 11. Open an Existing Project

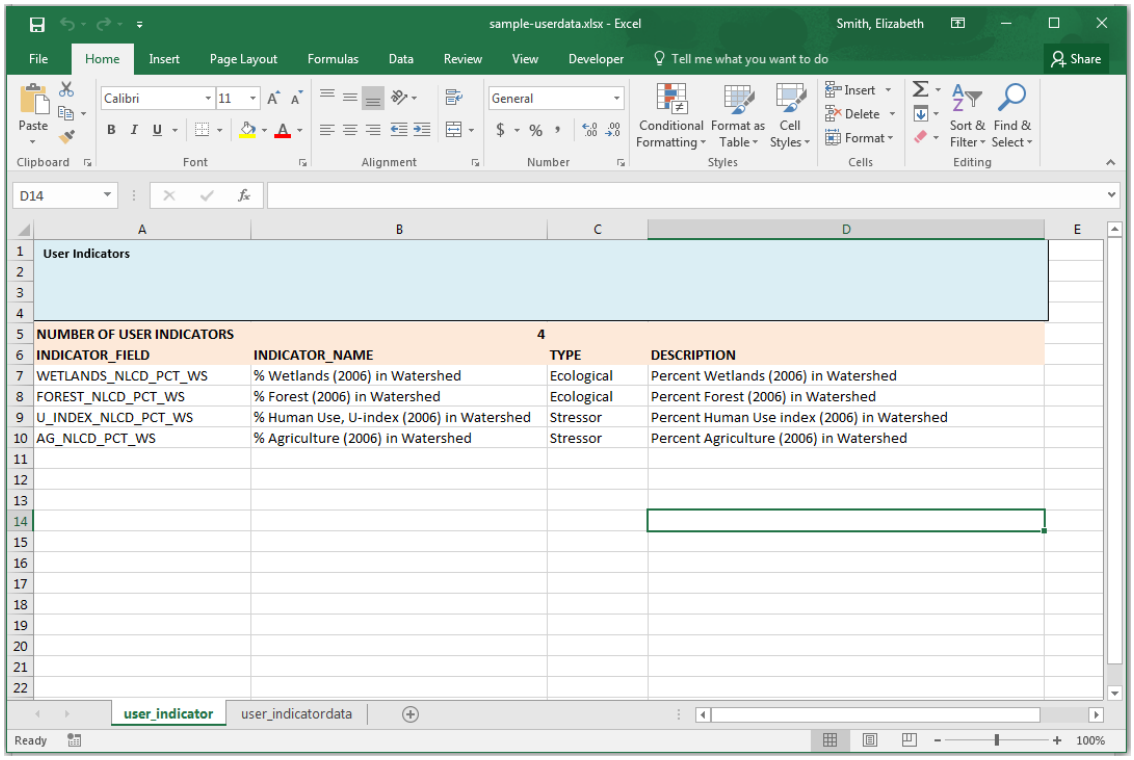
Run the WSIO.exe (See Section 1). The application will open with the option to use a 'Web Service' or a 'Local Geodatabase' to pull in indicators to the tool. Make a choice, then click '**OK**.' In the 'Project' window, select '**Open**.' Navigate to your saved project (the default will place your project in the 'Data' folder of your application folder). Open the *yourprojectname*.WSIO file. This file will contain the geography and indicators that were selected. You are able to change the HUC12 selections made within the geography that was originally downloaded and/or change indicator selections.

### A. Save-As

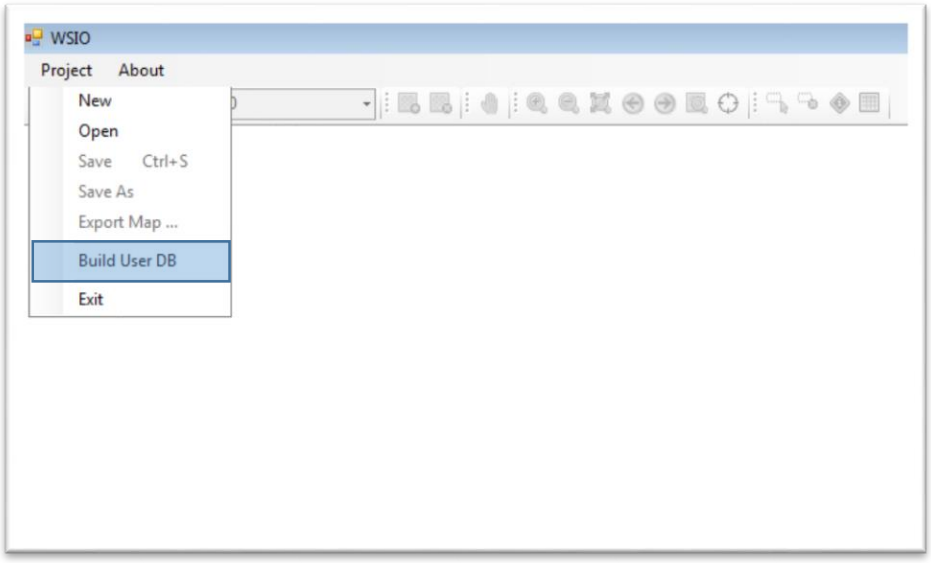
'Save-as' your project with a new name to be able to compare results to another WSIO screening run. Click on 'Project' in the upper left navigation menu and select 'Save As.'

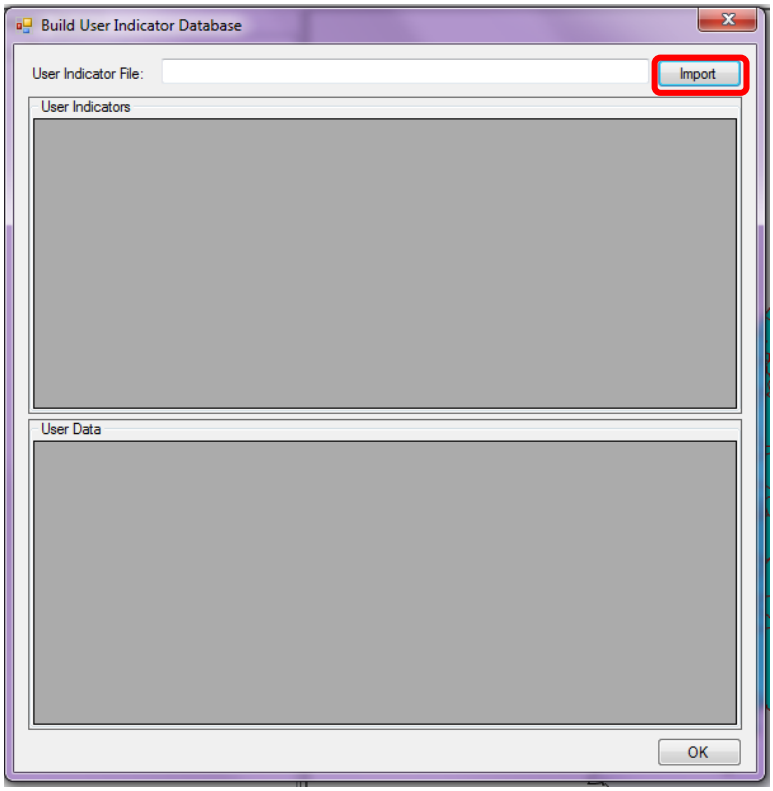
## 12. Build a User Database of Indicators

The WSIO Tool allows a user to bring in indicators of their own. These may be region or state specific indicators, for example, that have been identified and calculated for a specific area. In order to incorporate these regional specific indicators, the information about them needs to be put into the WSIO Tool as described in this section. A template has been created and provided for this purpose. Refer to the excel template (sample-userdata.xlsx) that is located in the 'Data' folder of the application package. There are two tabs that must be filled out completely – user_indicator (this is requesting information on each indicator) and user_indicatordata (this is requesting the indicator data for each HUC12). Once complete, this file can be imported into your project.

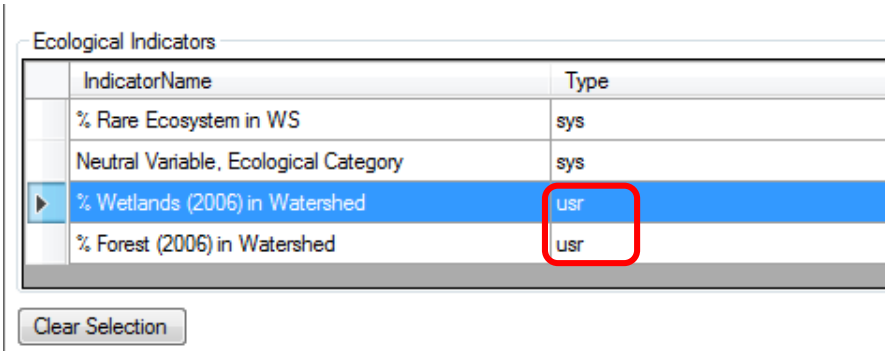



Within the application, click on '**Project**', then '**Build User DB**.' In the new window that opens, click on '**Import**' and navigate to your Excel file.


WSIO
Project
About
New
Open
Save Ctrl+S
Save As
Export Map ...
Build User DB
Exit


Build User Indicator Database
User Indicator File:
Import
User Indicators
User Data
OK

User imported indicators will be located at the end of the indicator list and identified in the type column as ‘usr.’




Refer back to Section 3 for instructions on how to build a project.

For additional information please refer to the WSIO webpage and user manual available here: https://www.epa.gov/wsio.