EPA Waterscape User Manual
Draft

Version 6.0, March 2015

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1. Getting started

1.1 Install the EPA Waterscape Tools

Software Requirements

- ArcGIS 10.1/10.2.x
- EPA Waterscape Tools 10.1 for ArcGIS 10.1 or 10.2 for ArcGIS 10.2.x

The EPA Waterscape tool is installed by running the setup file EPAWaterscape.msi.

- Double-click the msi file to launch the installation and click Next in the Welcome window.

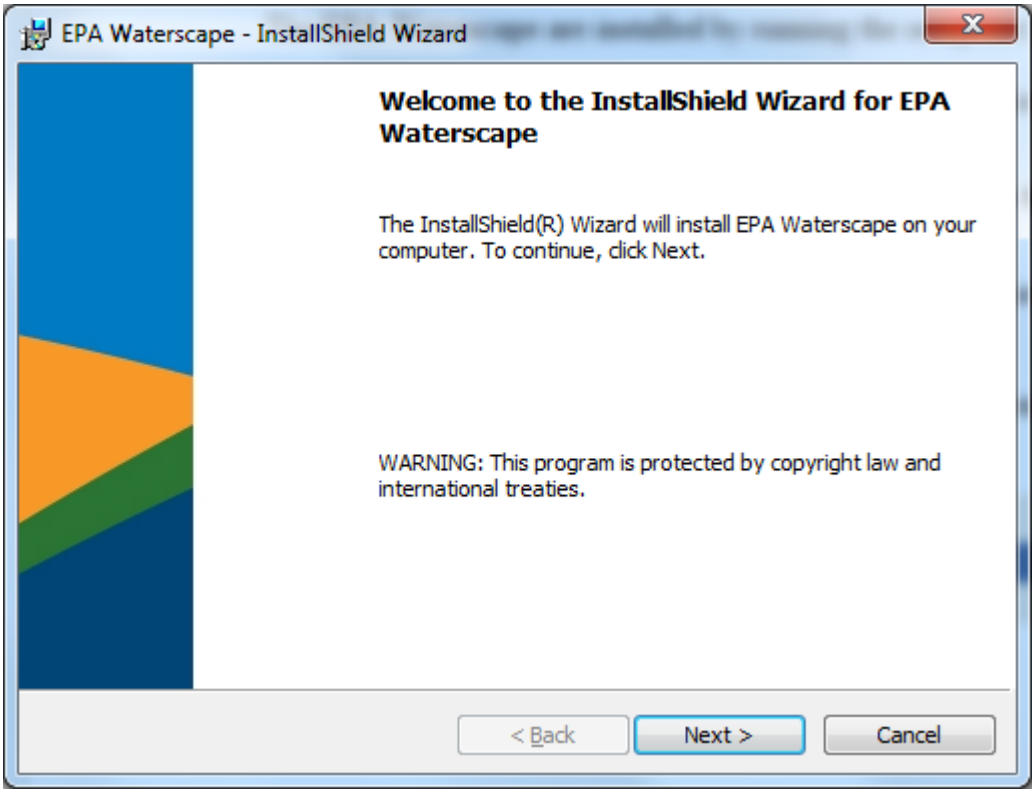


Figure 1-1 - EPA Waterscape InstallShield Wizard Welcome Window

The EPA Waterscape tools are installed by default under C:\Program Files (x86)\ESRI\EPAWaterscape.

- Modify the default installation location if needed and click Next to complete the installation process.

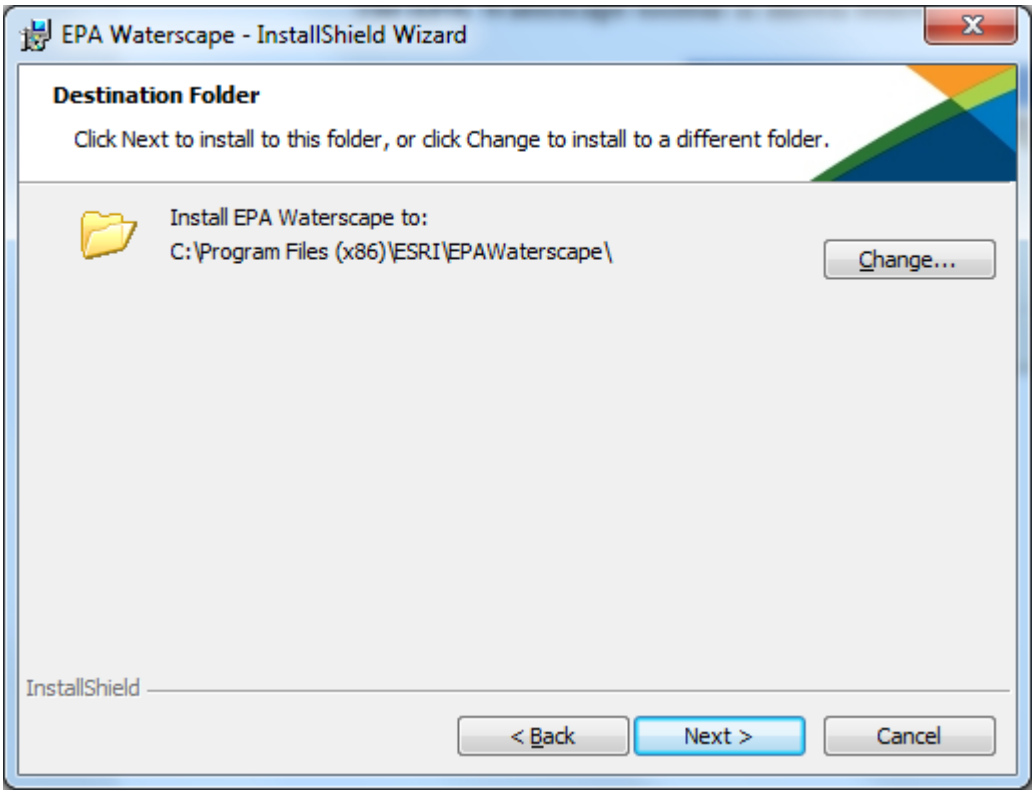
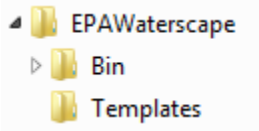


Figure 1-2 – Destination Folder

The installation creates 2 directories under the EPAWaterscape folder, Bin and Templates.



The Bin directories contains the applications files (.dll) as well as the online help (.chm), configuration file (.xml) and the default supporting file geodatabase (WaterscapeAdmin.gdb). It also contains the subdirectory lyrfiles storing the layer files defining the symbology used by the tools.

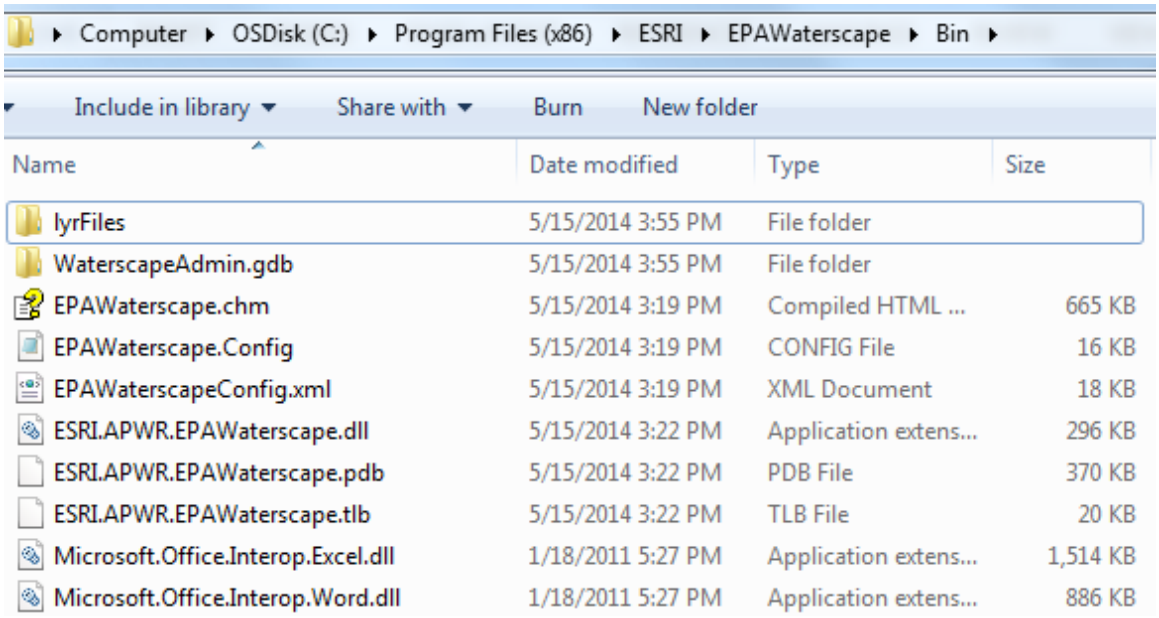


Figure 1-3 – Bin Directory Contents

The Templates directory stores the templates used when generating reports in Microsoft Excel or Word.

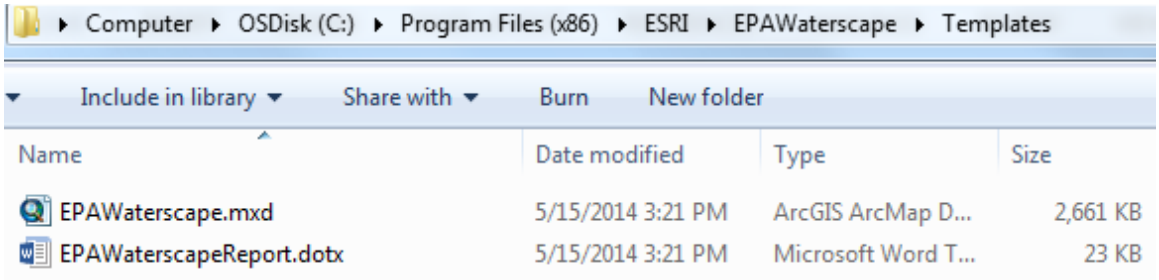
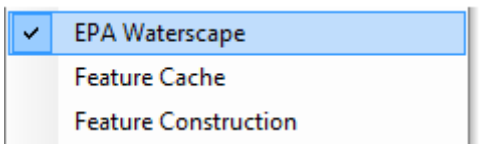


Figure 1-4 – Templates Directory Contents

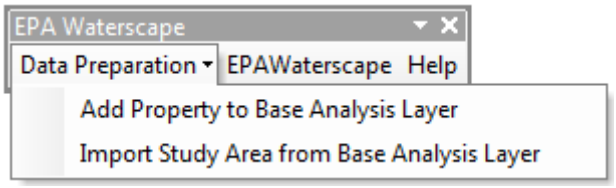
1.2 Open ArcMap and load the EPA Waterscape toolbar

- Open ArcMap. Create a new empty map, and save it as WaterscapeAnalysis.mxd (or any other name).

- Right click on the menu bar to pop up the context menu showing available tools and select EPA Waterscape.



The EPA Waterscape toolbar is shown below.



1.3 Data Requirements

The data required to perform the analyses is installed with the application. No additional data is required. If you want to use your own data, refer to section 3.0 Setting up custom data.

1.4 Online Help

The online help is available by clicking the Help button on the EPA Waterscape toolbar or in the forms for each function.

2. Creating a new Waterscape Analysis using existing Data

The EPA Waterscape tools allow ranking input polygon features using a set of preset properties to identify priority areas for a given purpose. A set of properties characterizing US States are installed with the application and may be used to run analyses. This supporting data is installed in the WaterscapeAdmin.gdb geodatabase located in the installation location\EPAWaterscape\bin folder.

2.1 Initialize EPA Waterscape Analysis Environment

- In your saved map document, click the EPAWaterscape function on the EPA Waterscape toolbar.

The tool copies supporting tables from the default WaterscapeAdmin.gdb geodatabase located in the installation location\EPAWaterscape\bin folder as well as the WSStudyArea feature class into a new geodatabase named after the map document and located in the same directory as the map document.

In the picture below, the map document was saved as WaterAnalysis.mxd in the EPAWATERSCAPE\Analyses subdirectory.
The tool created a new geodatabase called waterscapeanalysis.gdb as well in the same location. It copies the WSStudyArea feature class defining the study area polygons available for analysis as well as the EPAWaterscape administration tables:

- WSAnalyses
- WSAnalysesType
- WSAnalysisSteps
- WSProperties
- WSPropertyAnalysisStep

Initially, only the WSProperties and WSAnalysisType tables are populated.
The other tables will be populated with the information generated when creating the new analyses.

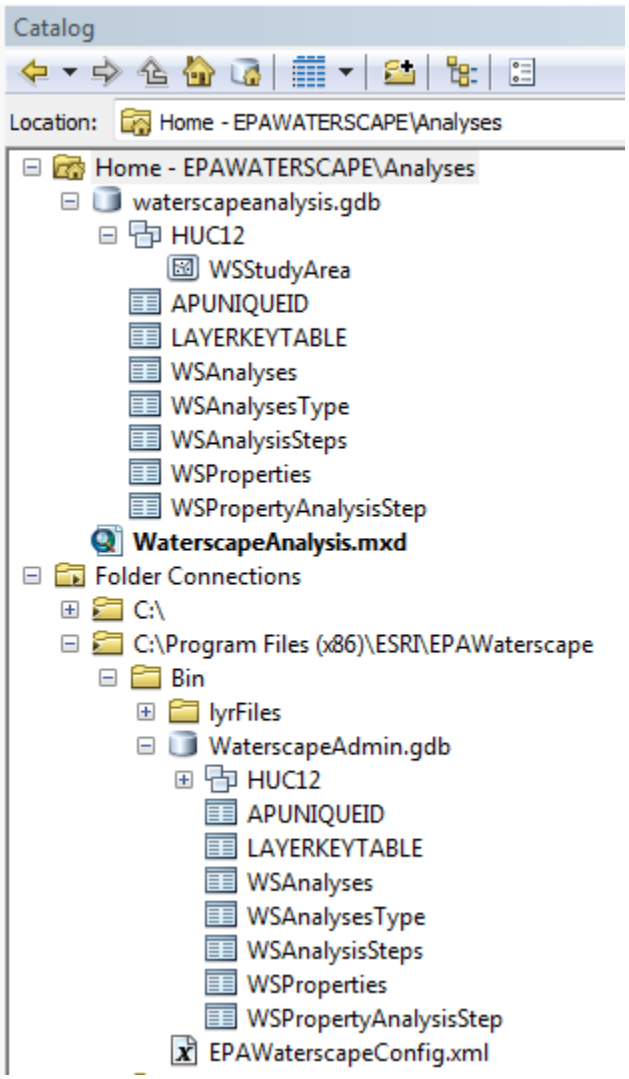


Figure 2-1 – Initial Database

The tool adds the WSStudyArea polygon feature class into the Tables of Contents of ArcMap. This layer shows the area where analyses may be performed.
The tool also adds the supporting tables for the Waterscape analysis.

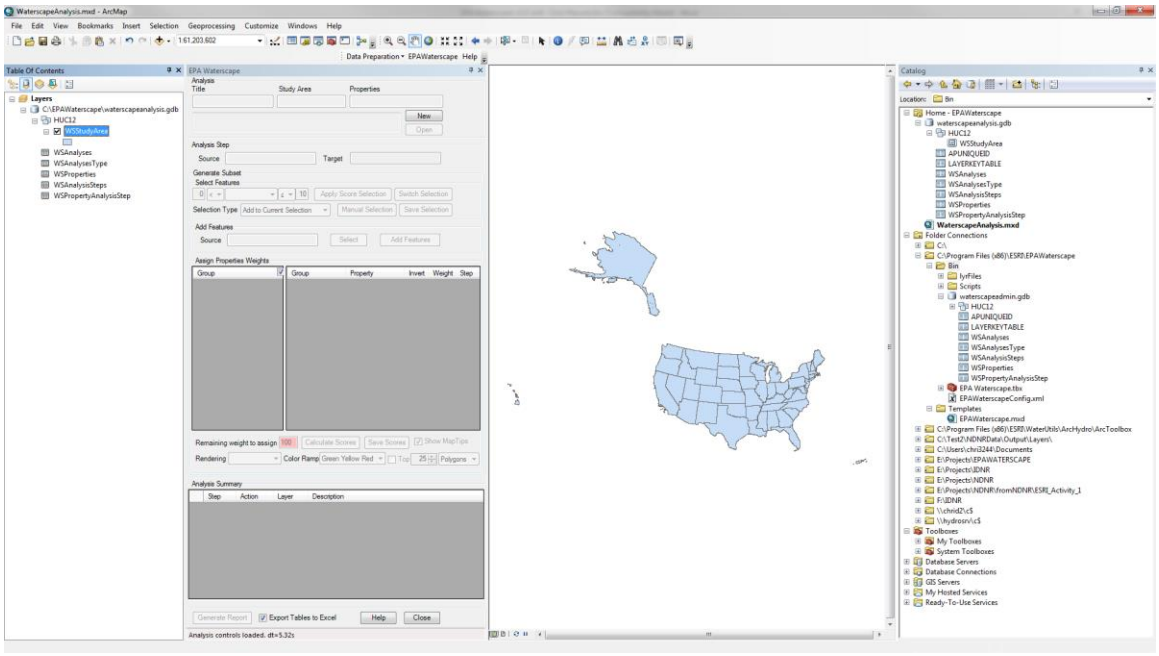


Figure 2-2 – Initial Data added to the map

It opens the EPAWaterscape form that may be docked in the screen. The form does not contain any existing analysis initially.

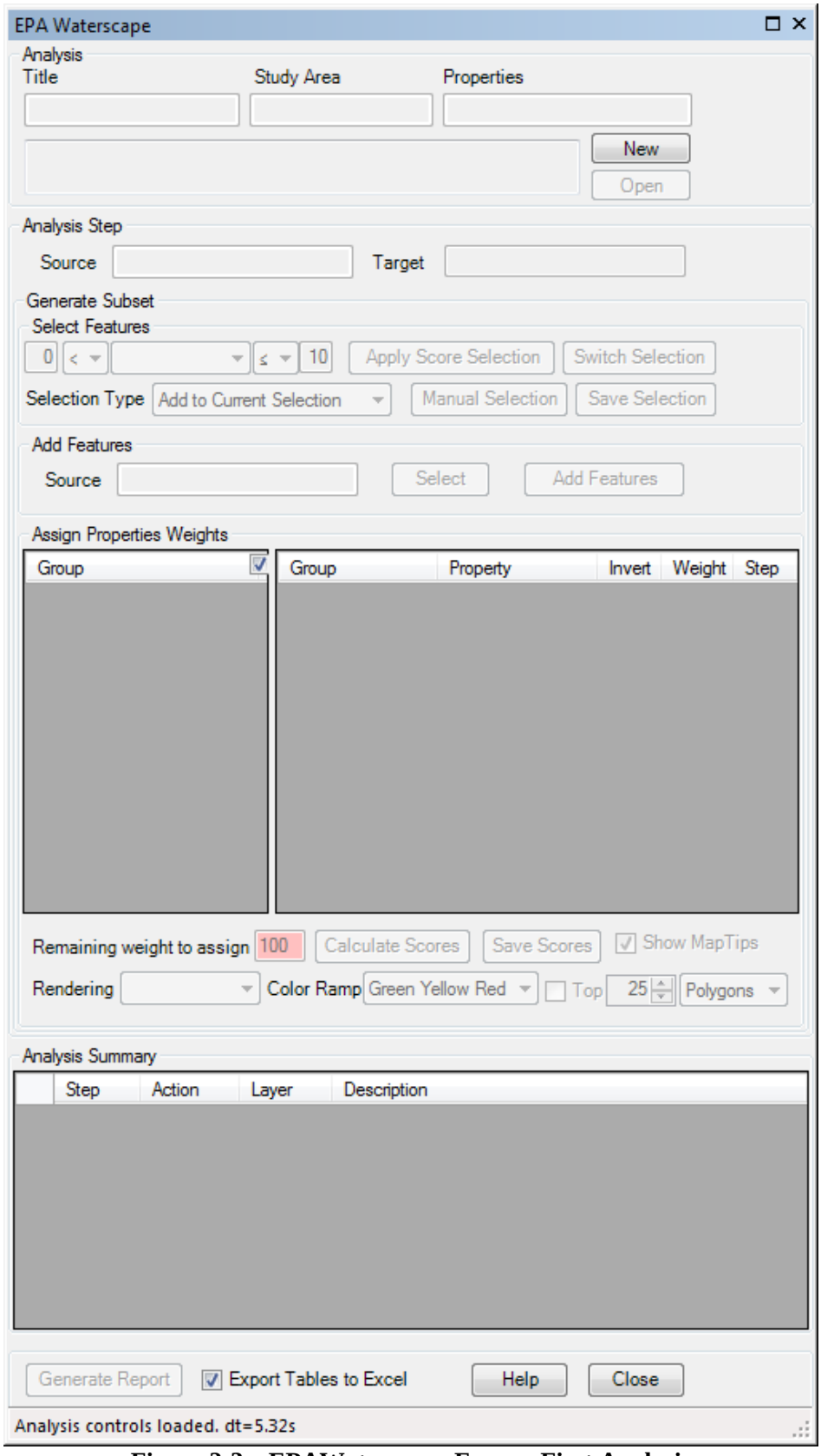


Figure 2-3 – EPAWaterscape Form – First Analysis

2.2 Create New Analysis

- Click the New button to start creating a new analysis.

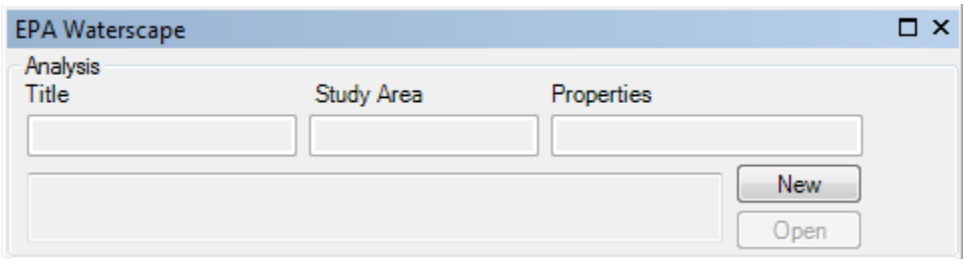


Figure 2-4 – New Button in EPA Waterscape Form

The 'New' button is renamed 'Create'.
The top section of the form is editable and a title and description for the new analysis may be entered.
The Study Area dropdown lists all the available study areas where analyses may be performed.

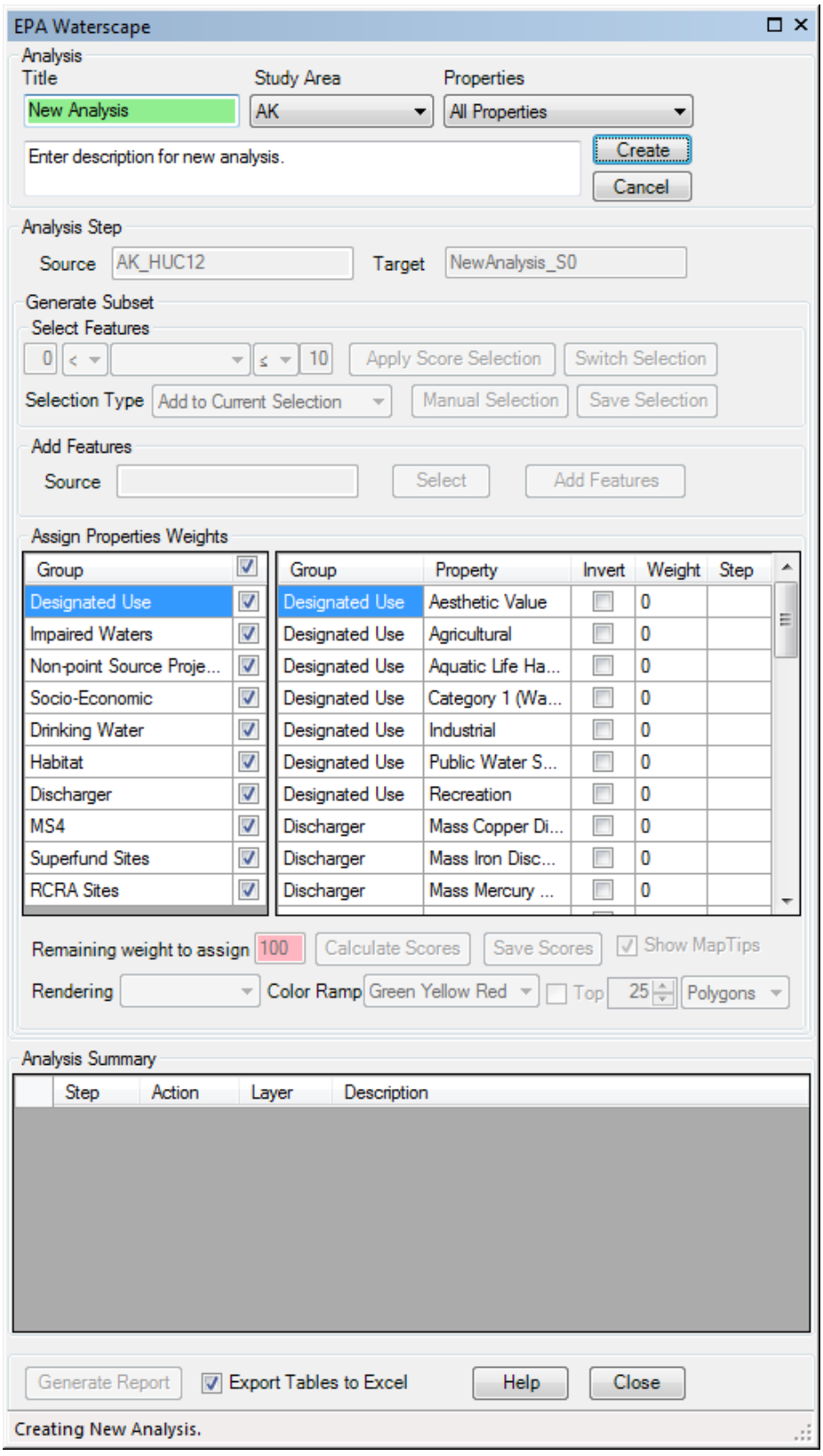


Figure 2-5 - New Analysis – After clicking 'New'

The Property dropdown lists property groups available for the current selected StudyArea. By default only the group All Properties is available. Additional groups may be created by selecting the New… option in the Properties dropdown list.

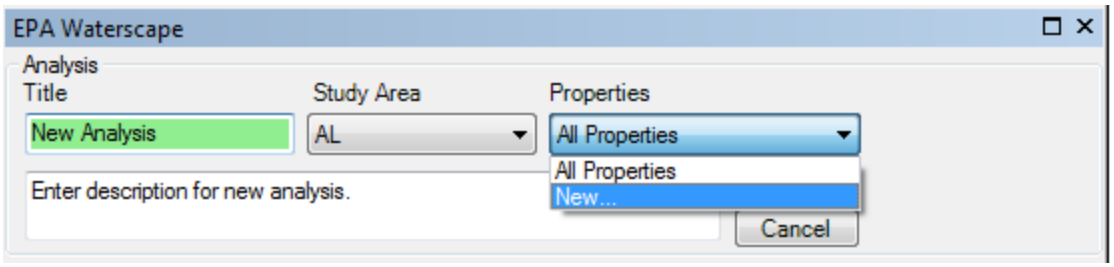


Figure 2-6 – New… Properties Option

After clicking New, a new grouping of properties for the current StudyArea may be created and made available in the main EPAWaterscape form.

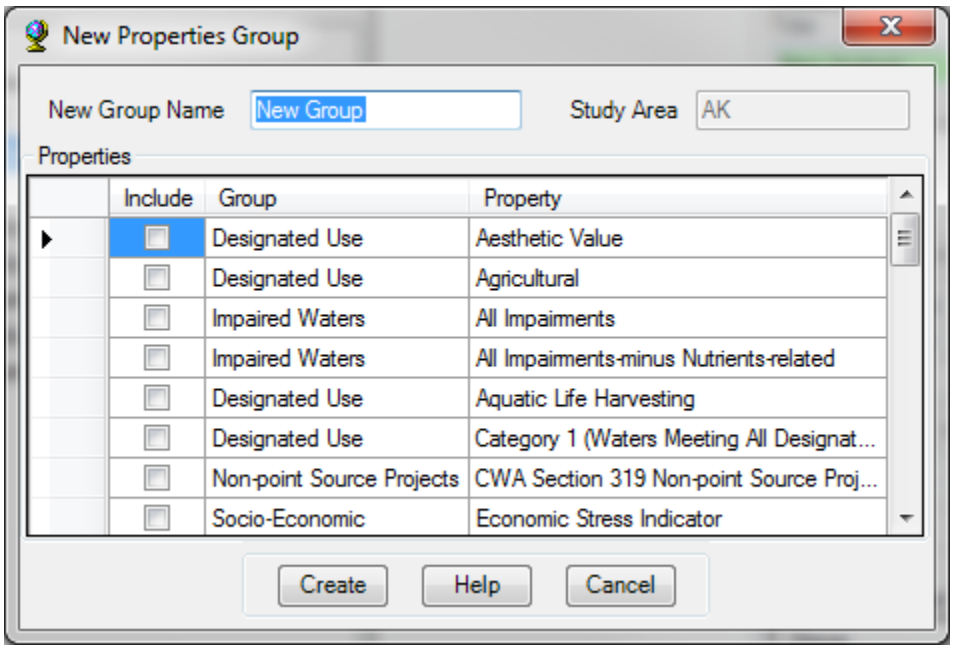


Figure 2-7 – New Properties Group Window

- Enter a title and description for the new analysis, select the StudyArea and Properties of interest and click Create.

The Create button reverts back to New.

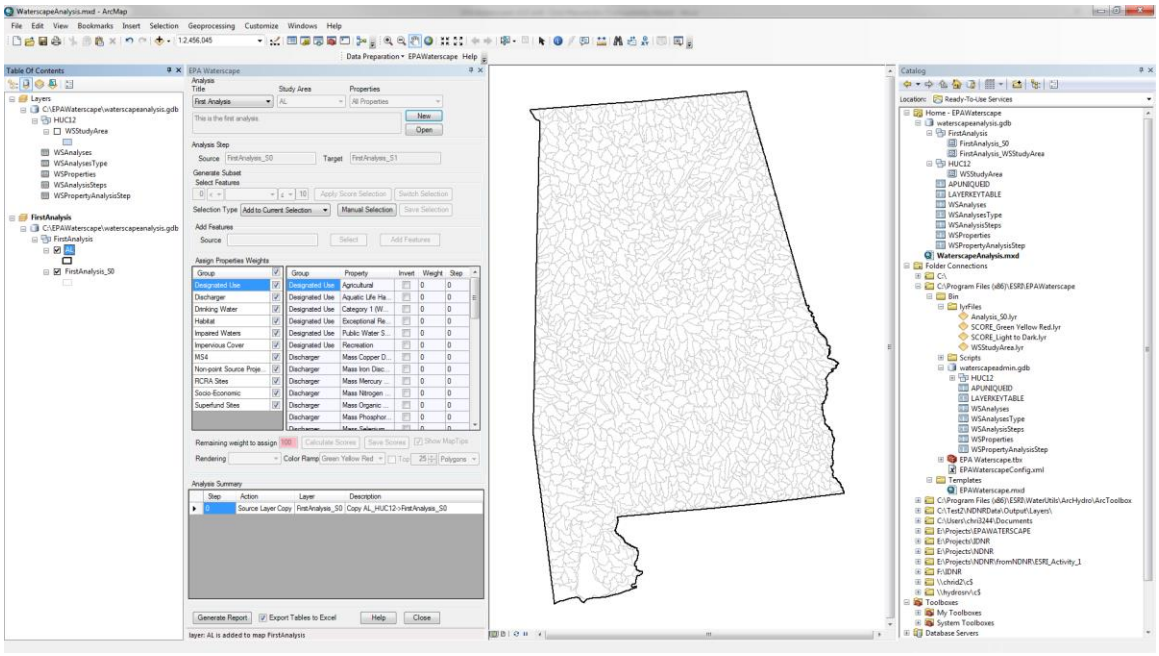


Figure 2-8 – New Analysis – After Clicking 'Create'

The tool copies the supporting data associated with the selected StudyArea into a new feature dataset named after the analysis and adds it into the map as the S0 layer named by concatenating the analysis name with the suffix "_S0".
The StudyArea feature is copied into the feature dataset into the feature class named by concatenating the analysis name and the suffix "_WSStudyArea"

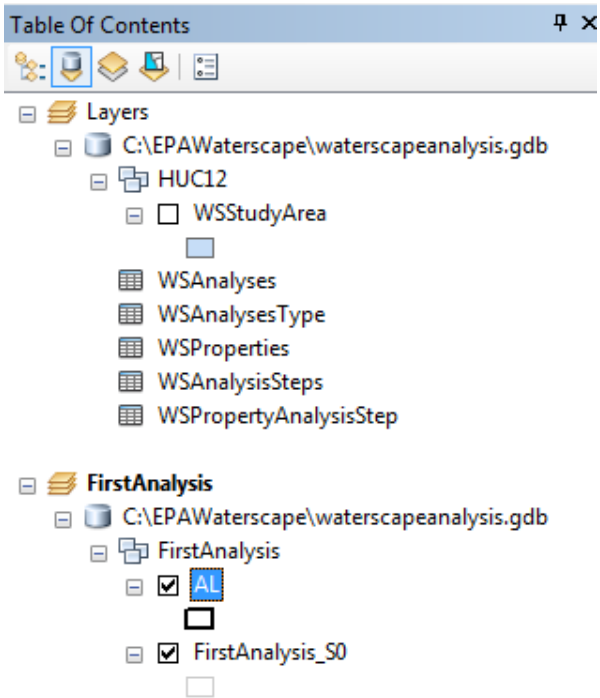


Figure 2-9 – Table of Contents – Create Step

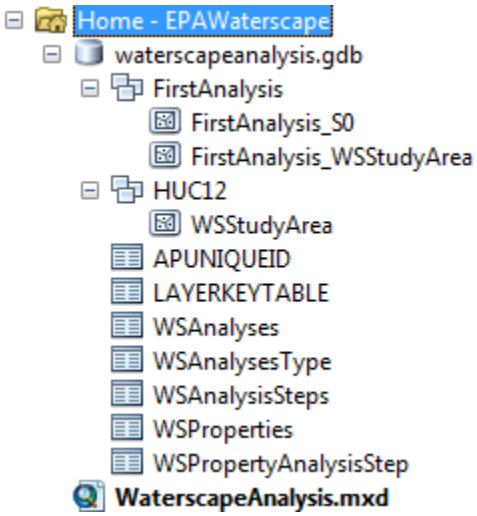


Figure 2-10 – Geodatabase – Create

The top section of the form becomes read-only once the analysis has been created. You can either pursue the existing analysis, create a new one by clicking New, or open a saved analysis by clicking Open. This section will describe how to continue with the newly created analysis.

The Analysis Step 0 of type Source Layer Copy is written to the Analysis Summary table (within the form).

The Properties are sorted based on the Group name and Property Name initially. You can click the Property Header to sort the Properties alphabetically or filter the properties based on their Group by checking the boxes associated to the Group names.

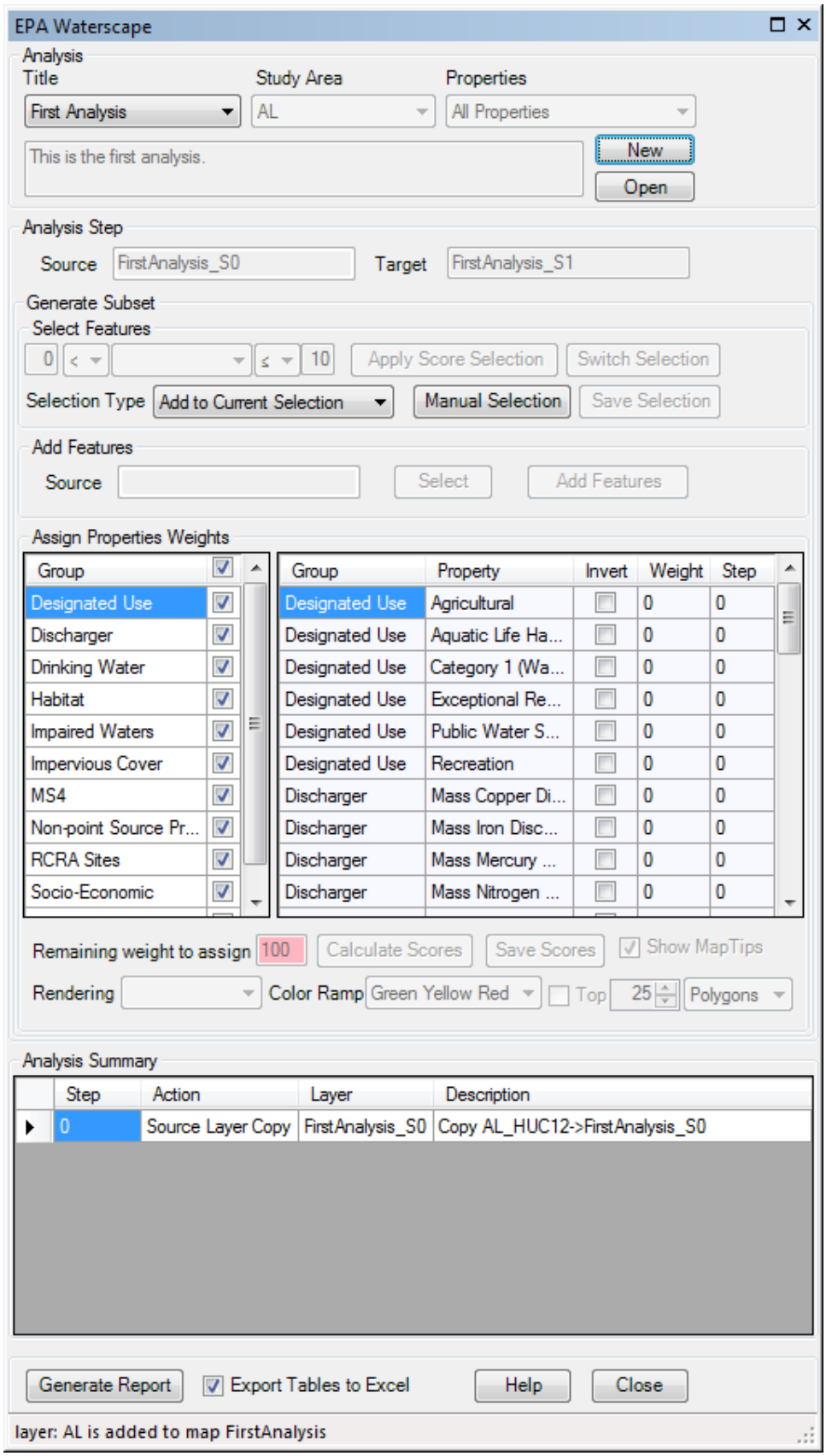


Figure 2-11 – EPAWaterscape Form – After Clicking 'Create'

2.3 Generate Initial Subset

2 operations may be performed as the first step in the analysis:

- Generate subset by selection.
- Calculate score for all features.

Example of generating a subset with selections:
The saved selection from this step determines the set of available features in the following step (however features can subsequently be manually added back in).

- Click the Manual Selection button in the form.

Note
The manual selection steps being performed must be captured by the user in the metadata window displayed by clicking Save Selection if they are intended to be used in the report.

The Switch Selection and Save Selection buttons are now enabled. The selection environment is set in the Selection Type dropdown.

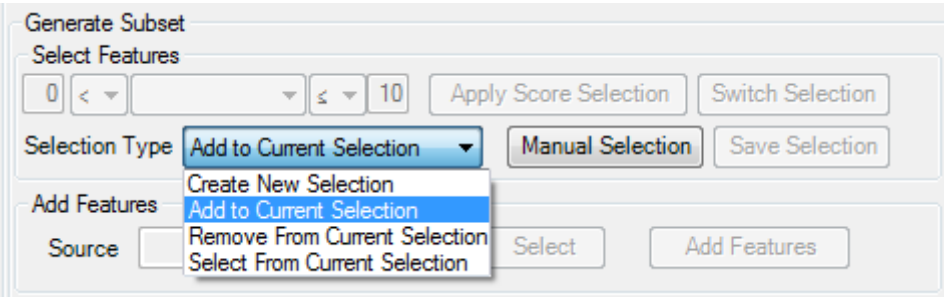


Figure 2-12 – Generate Subset

- Click map features to create a selection. Change the Selection Type to ‘add’ or ‘remove’ and continue interacting with the map if you need to add or remove features from the selected set.

Note
You can also use any out of the box ArcMap selection tools to perform the selection.

- Once you are satisfied with the selection, click Save Selection.

You will be prompted to enter a description for the action you just performed. You can keep the default description or modify the text. This text will be used in the report to document the process.

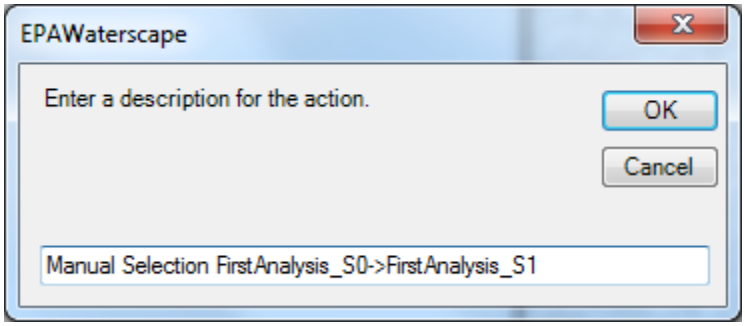


Figure 2-13 – Generate Subset - Description

- Modify the Description if needed and click OK.

The selected features are copied into a new feature class added to the map that is named by concatenating the analysis name with the suffix "_S1".
The map zooms to the extent of this new layer. The initial S0 layer and StudyArea layer remain visible.

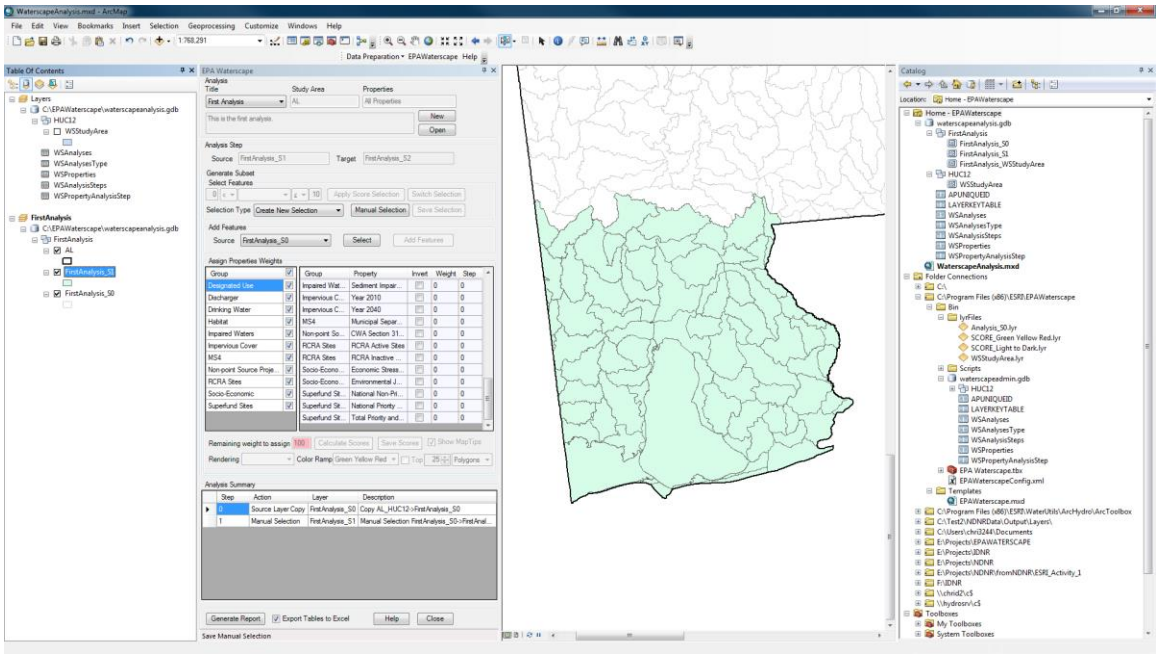


Figure 2-14 – Generate Subset Result

The subset generation step is written to the Analysis Summary window as Step 1 of Action type Manual Selection.

Analysis Summary

Step	Action	Layer	Description
0	Source Layer Copy	FirstAnalysis_S0	Copy AL_HUC12->FirstAnalysis_S0
1	Manual Selection	FirstAnalysis_S1	Manual Selection FirstAnalysis_S0->FirstAnalysis_S1

Figure 2-15 – Analysis Summary after Step 1

Since a subset has been generated, the Add Features section's Source combo box is populated with the initial source layer to provide the ability to add back features that were not originally selected.

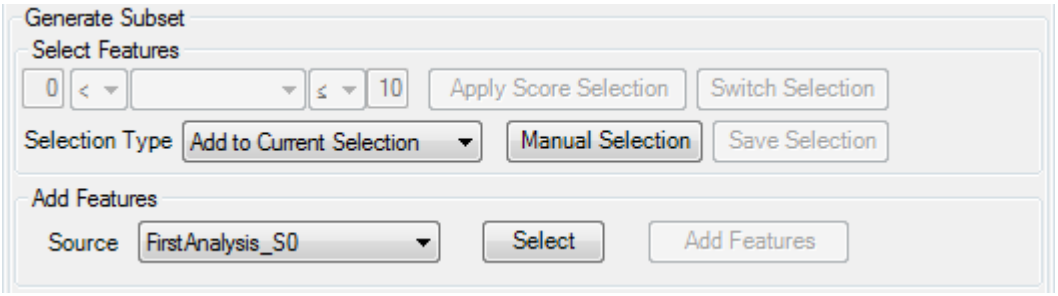


Figure 2-16 – Add Features after subset

2.4 Generate First Score

The next step in the first analysis is to calculate a score that will later be used to perform additional selection(s). Only the properties having non null values for the selected Study Area are displayed in the Assign Properties Weights window.

The Assign Properties Weights section of the form may be used to set the weight to the properties of interest and calculate the corresponding score. The sum of the weights must add up to 100. A property may be used as is or inverted (The 'invert' function can be used to change property scores from the default 1 (lowest) – 10 (highest) to 10 (lowest) – 1 (highest)). A property may be used only in one score in a given analysis and will be associated to a specific step.

The properties are initially sorted by Group and Property within a group. You can sort by Property independently from the Group by clicking on the Property header. To resort based on both the Group and the Property, click Open to reopen the analysis.

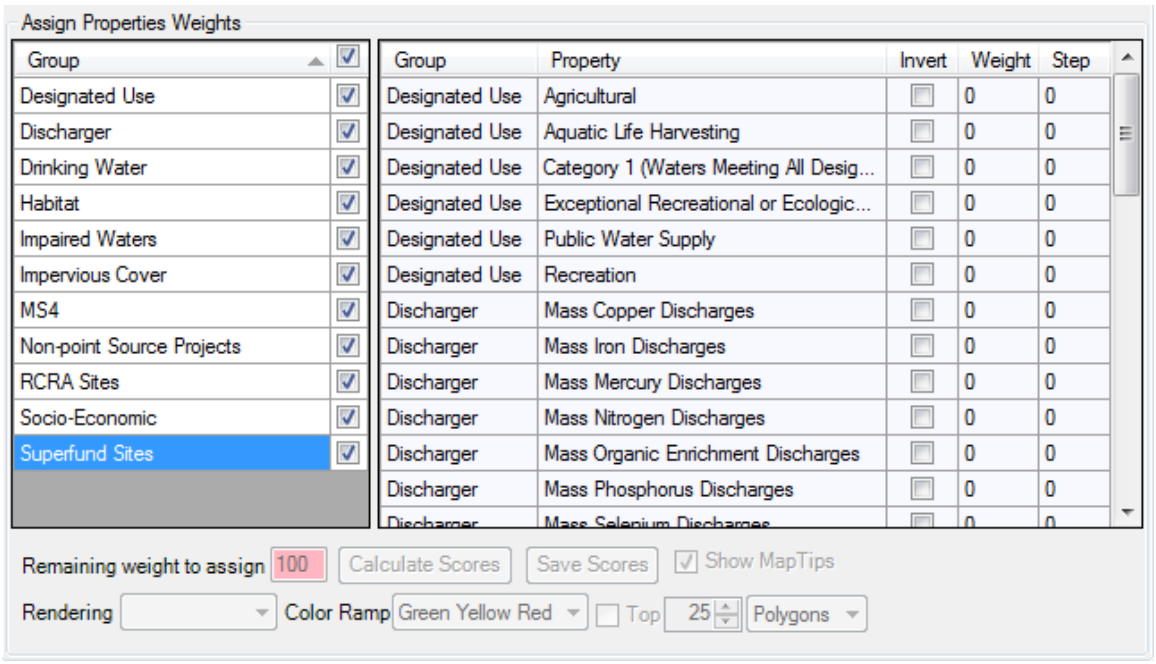


Figure 2-17 – Assign Properties Weights - Initial Status

You can filter the properties belonging to specific groups by checking on and off the group names.

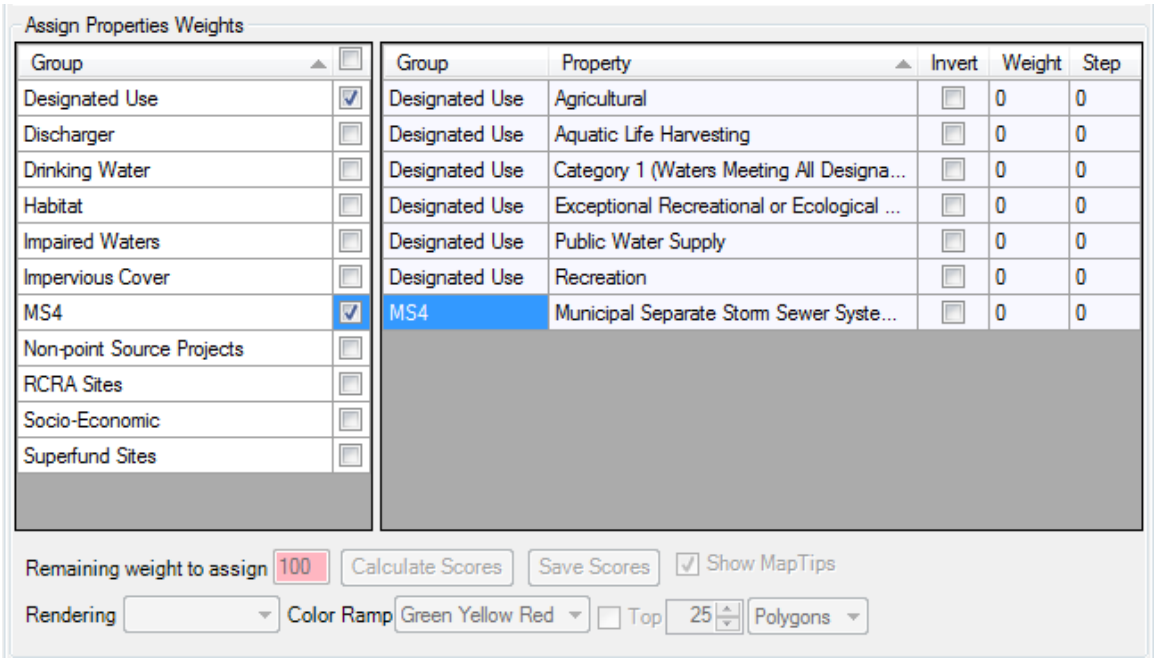


Figure 2-18 – Properties filtered based on Group Names

- Enter weights in the Weight column for some of the properties so that their sum adds up to 100.

The 'Remaining weight to assign' box becomes green and its value is 0. The Calculate Scores button becomes enabled.

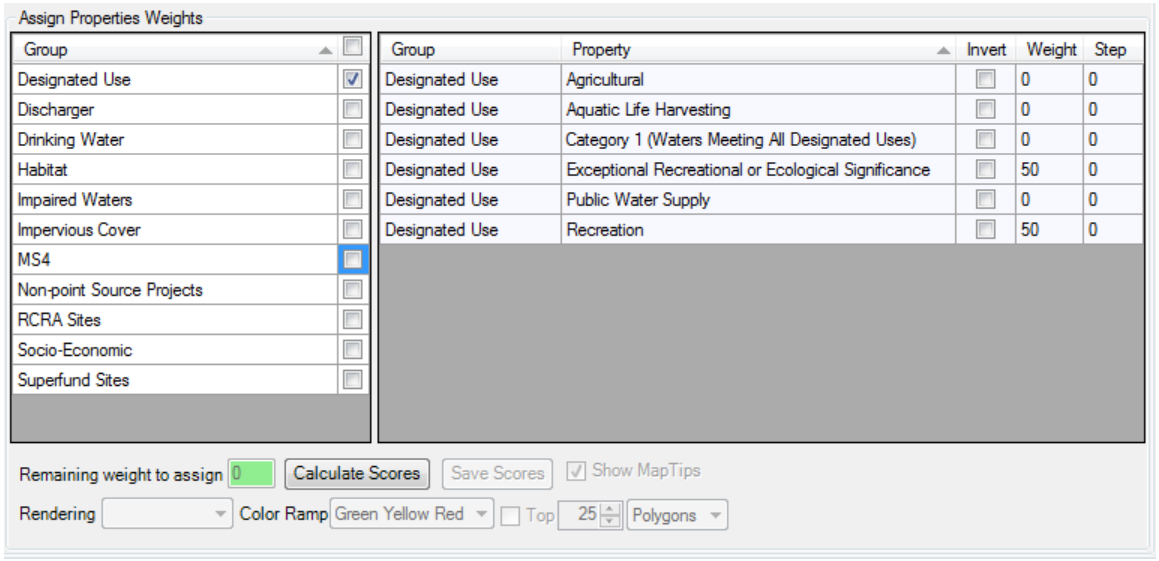


Figure 2-19 – Assign Properties Weights - Final Status

- Click Calculate Scores.

The tool copies all source features into a new feature class named by concatenating the analysis name with the suffix _S2. It adds weight fields for each of the properties named by adding the prefix "W_" to the properties fields' names. It also adds a field to store the score that is named by appending the current step with the suffix score (e.g. Step2Score). This field is used for rendering the layer in the map.

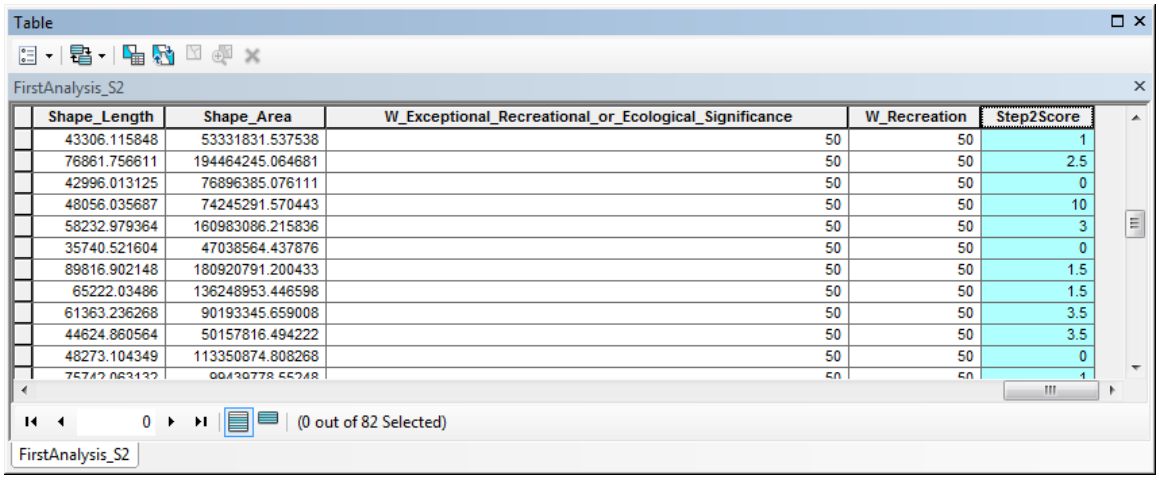


Figure 2-20 – Weight Fields and Score Field

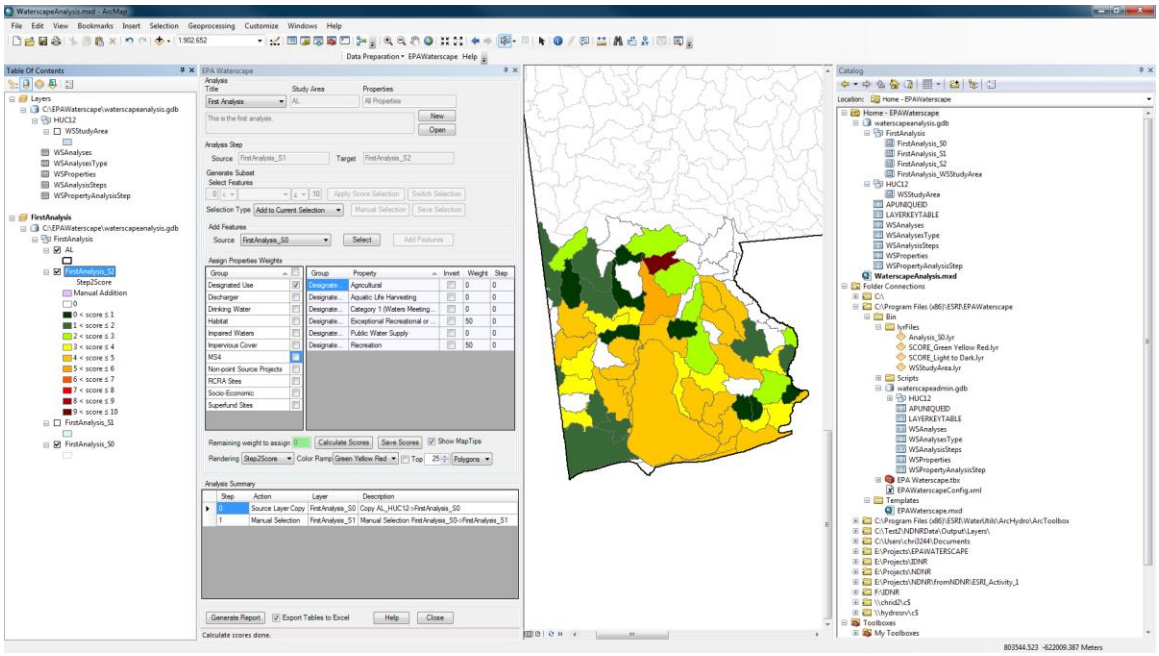


Figure 2-21 – Calculate Score Step Result

The symbology used to render the layer is imported from the layer file associated with the selected Color Ramp. The layer files are stored in the install location\Bin\lyrFiles folder and the user may add their own layer files.
The new layer is added under the StudyArea (Al) layer showing the boundary of the area of interest. The initial S0 layer remains visible to provide some background. Otherwise the layer created in step 1 is turned off by default.

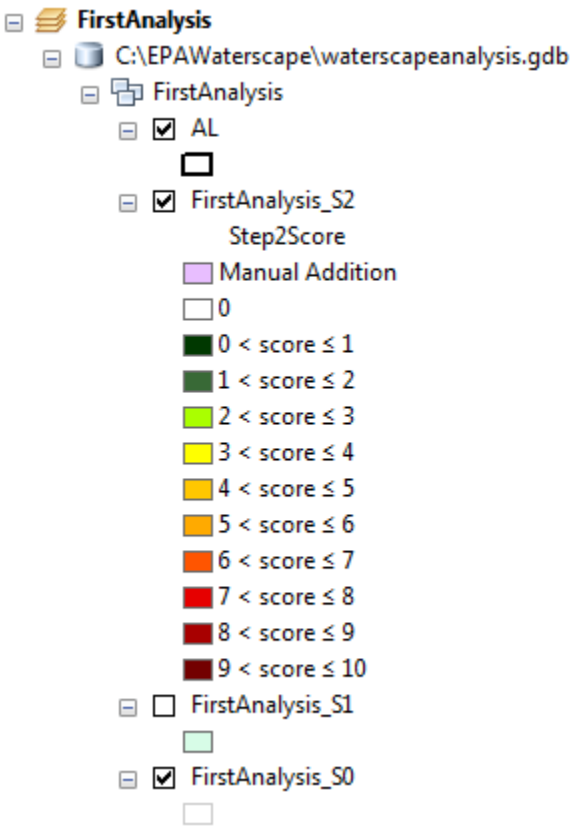


Figure 2-22 – First Analysis_S2 Layer

The field used to render is displayed in the Rendering dropdown. By default, the layer is rendered using the last calculated Score. The symbology used corresponds to the selected ramp in the Color Ramp dropdown. The list of available color ramps may be customized (refer to section 4.1 for more information on adding your own symbology).

The Show MapTips checkbox indicates whether to display the score being rendered as a map tip when hovering over a feature with the mouse on the map.

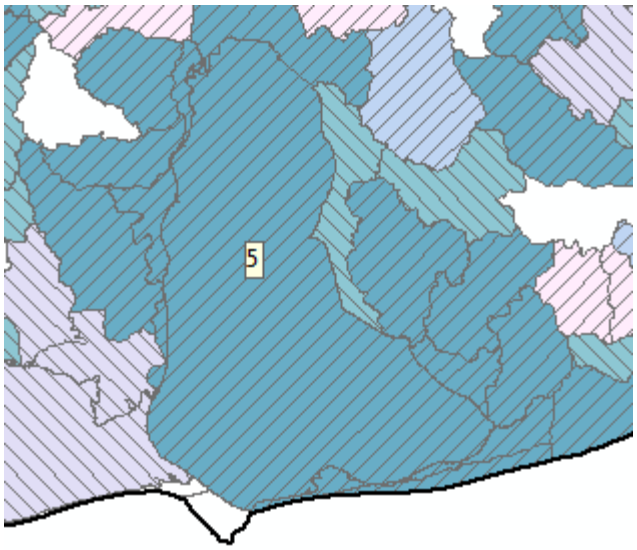


Figure 2-23 – Score Displayed with Map Tip and an Alternative Color Ramp

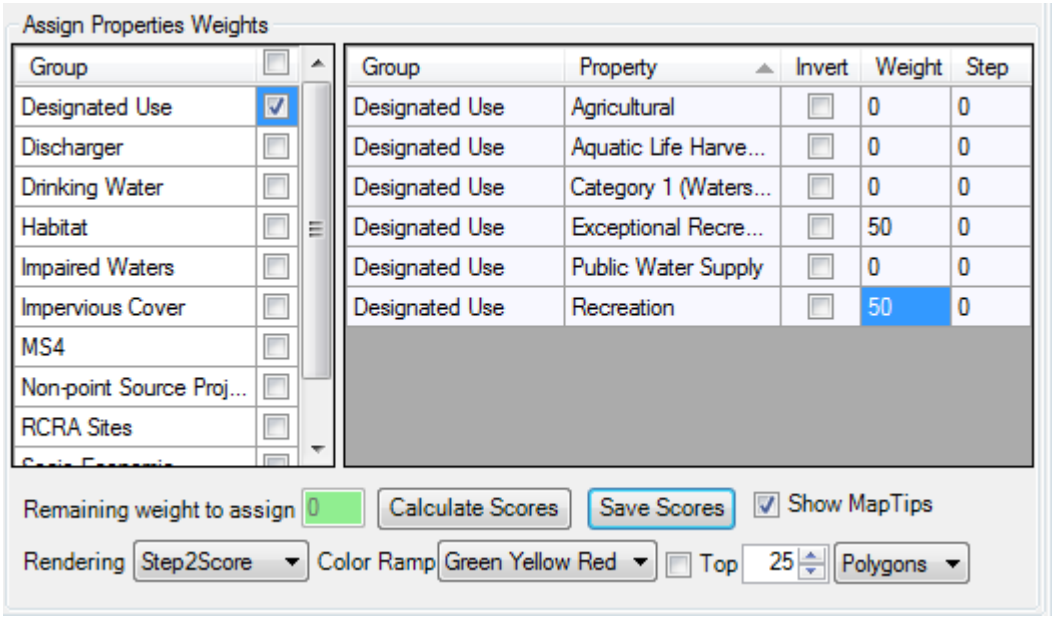


Figure 2-24 - Assign Properties Weights after Calculating Scores

After Calculate Scores, a new layer is created but the step is not yet completed. The user has the option to modify the weights and recalculate the score using different weights. Once the user is satisfied with the score calculated, the step may be completed by clicking the button Save Scores that is now enabled.

- Click Save Scores.

The tool prompts for a description for the current step that will be used in the report.

- Modify the text if needed and click OK.

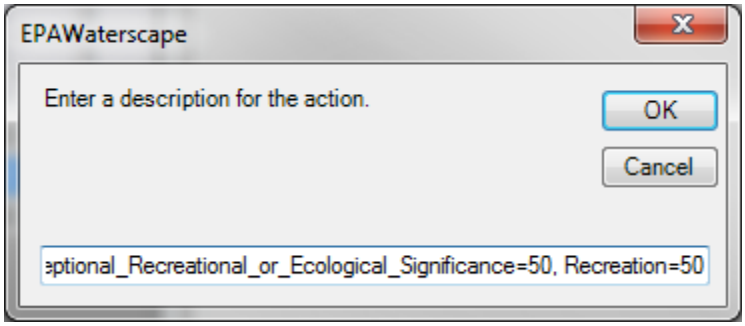


Figure 2-25 – Calculate Score Step Description

The Score Calculation Step is written to the Analysis Summary table.
The Properties used to calculate the score in Step 2 are greyed out to indicate that they are not available for future score calculations. Their associated Step (2) is written in the Step column.
Remaining weight to assign is reset to 100 (red) and the Calculate Scores and Save Scores buttons are disabled.

The field Step2Score is added to the Select Features dropdown list and may be used to reselect features to create a new subset. The Apply Score Selection button is now active.

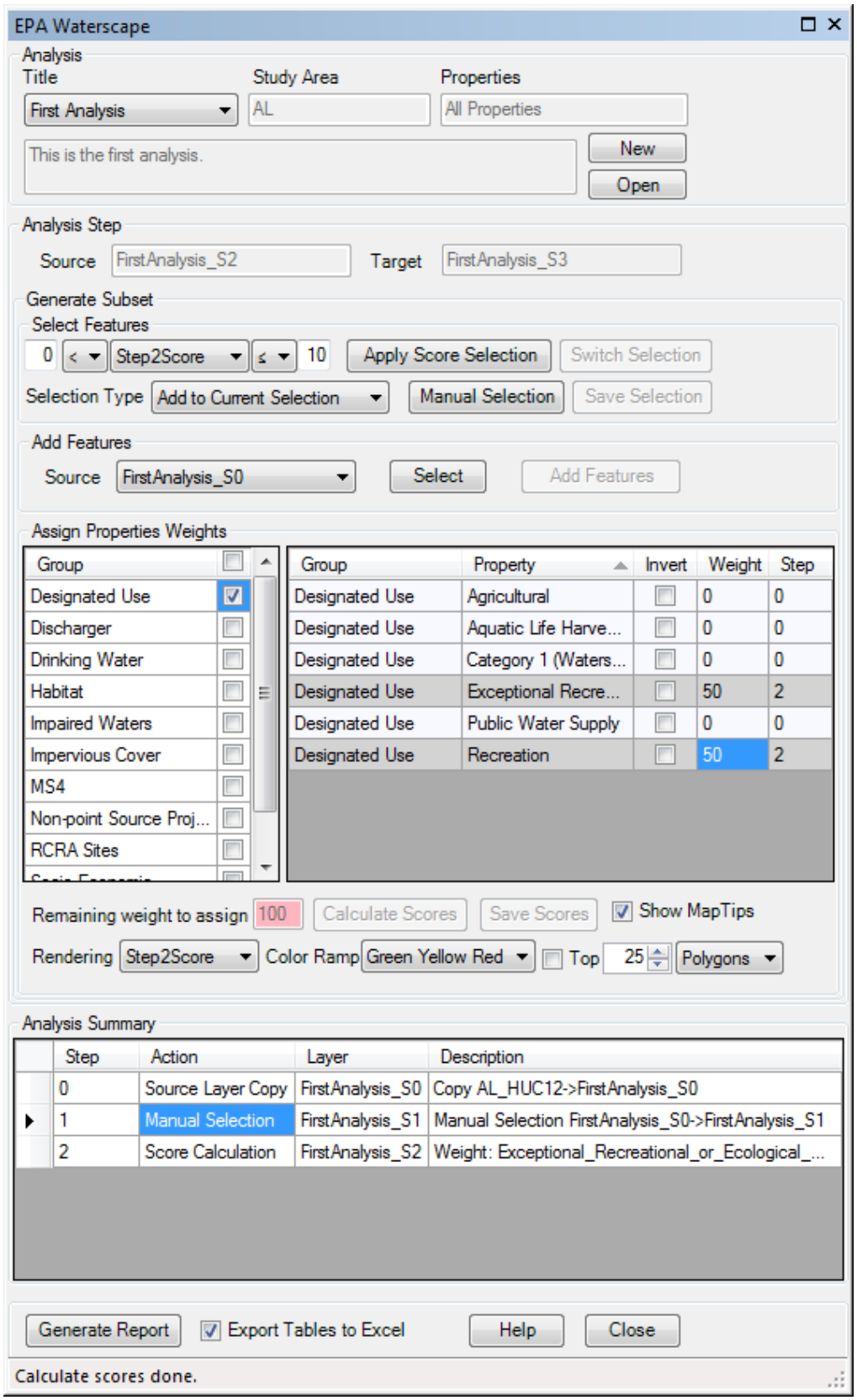


Figure 2-26 – EPA Waterscape Form after Saving Score 2

2.5 Generate Second Score

The next step in this example calculates a new score using different properties.

- Assign weights to new properties so that they add up to 100.
- Click Calculate Score and Save Score.

The new properties are assigned to Step 3
The new Score Calculation Step is written to Step 3 in the Analysis Summary table.
The Select Features combo box contains both Step2Score and Step3Score that may both be used to generate a selection set.

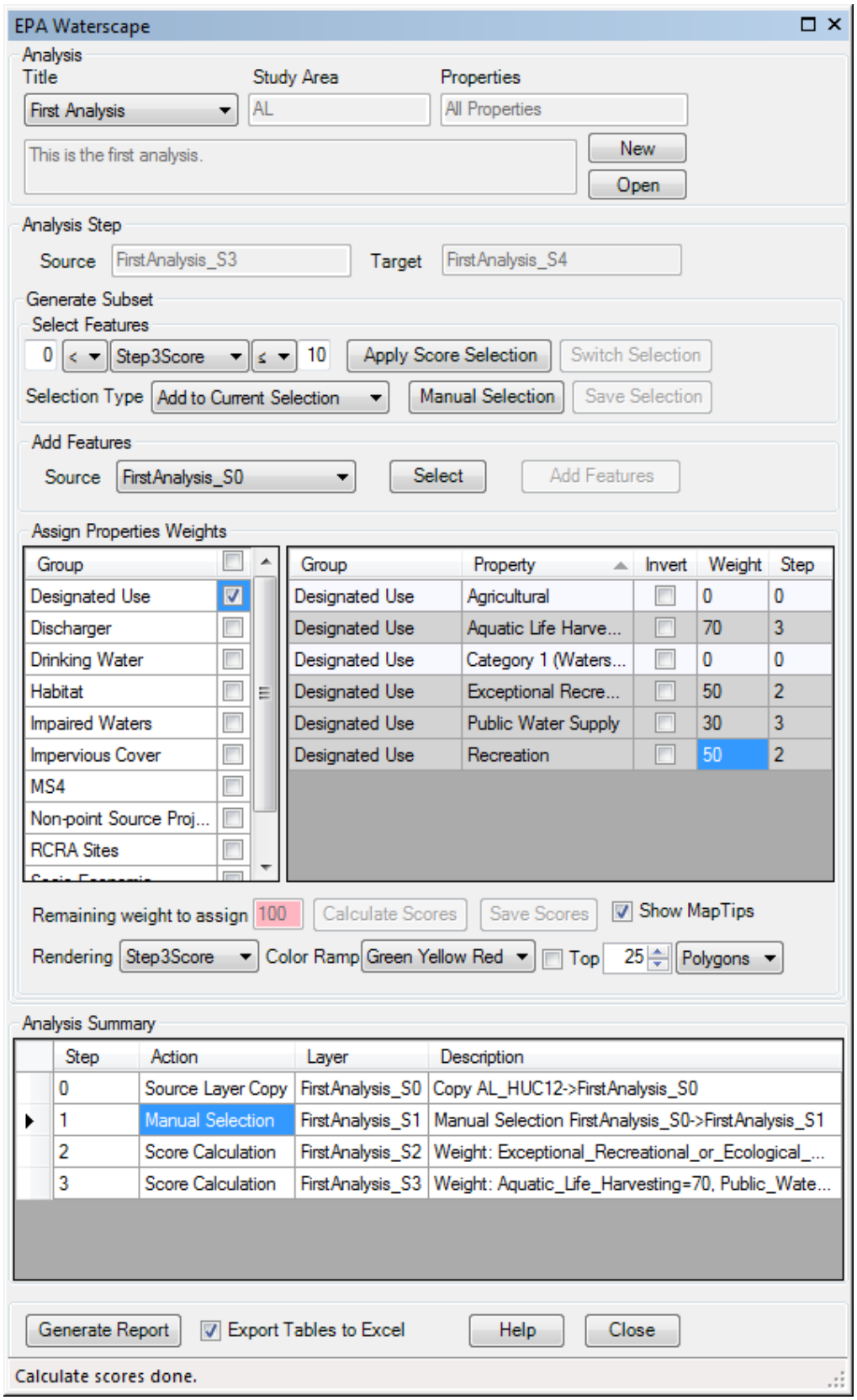


Figure 2-27 – Properties after Second Score

The new Step3 layer is added into the Table of Contents of ArcMap under the Study Area layer. It uses the symbology selected in the Color Ramp dropdown list and Step3Score as the Rendering field instead of Step2Score.

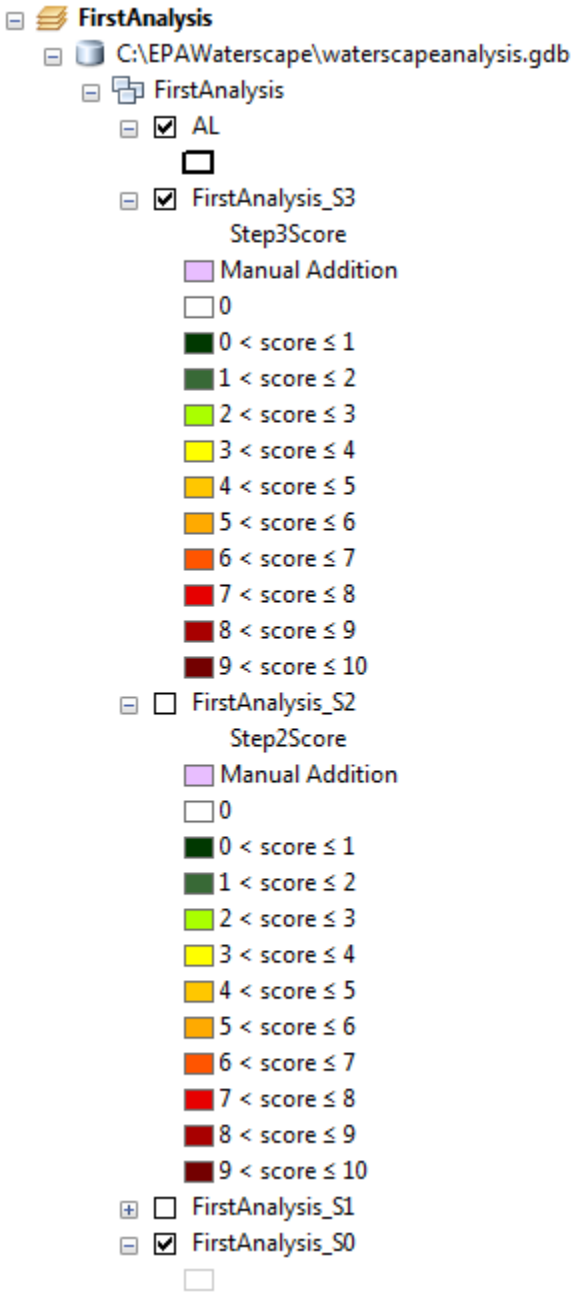


Figure 2-28 – Rendering for Second Score

Note
You can switch the field used to render by selecting a different score field in the Rendering dropdown list.

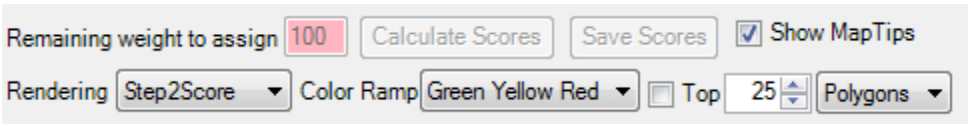


Figure 2-29 – Update Rendering using different Score Field

2.6 Generate Second Subset

The 2 scores just calculated and saved may be used to select features to generate a new subset. For example, we can select features where Step2Score >=4, and reselect from those the features with Step3Score>=5.

- Specify 4 <= and Step2Score.

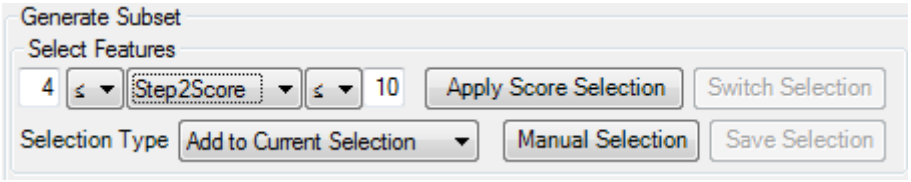


Figure 2-30 – Apply Score Selection using Step2Score

- Click Apply Score Selection.

The Switch Selection and Save Selection buttons become enabled.

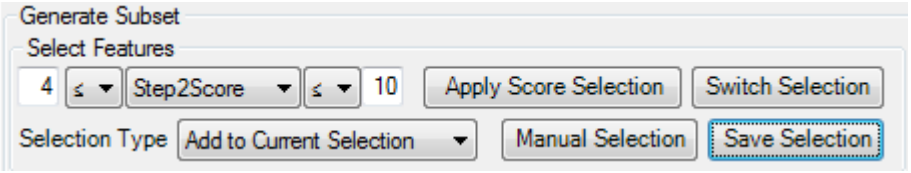


Figure 2-31 – After Applying Score2Score Selection

- Specify 5 <= and Step3Score. Set Selection Type to 'Select From Current Selection' and click Apply Score Selection.

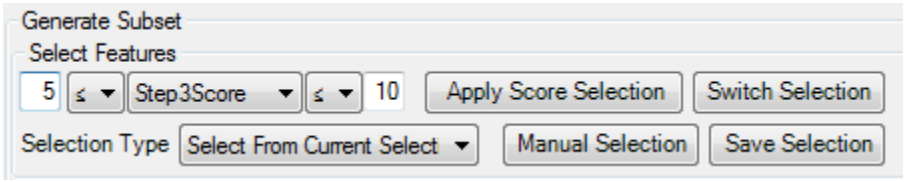


Figure 2-32 – Reselecting based on Step3Score

- Click Save Selection. Enter the description for the selection performed and click OK.

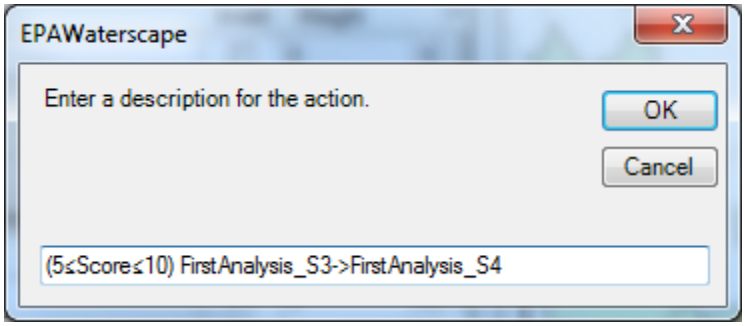


Figure 2-33 – Initial Description

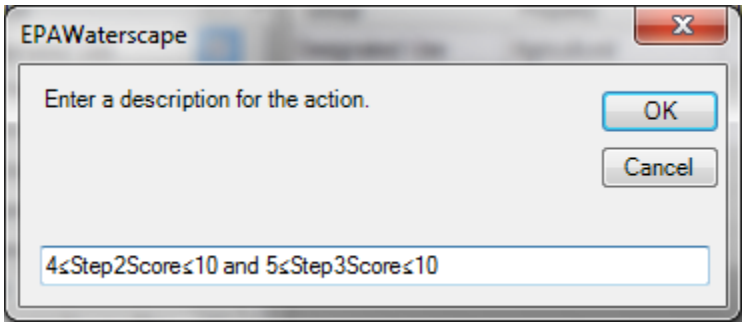


Figure 2-34 – Edited Description

The subset is copied into a new layer named by concatenating the analysis name and "_S4". The layer is rendered using the last computed Score.

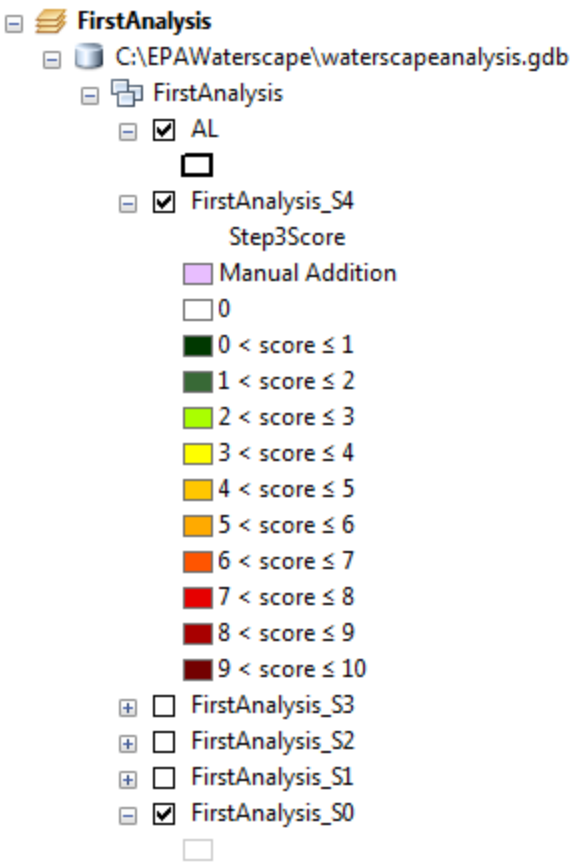


Figure 2-35 – Subset Layer Rendered using last computed Score

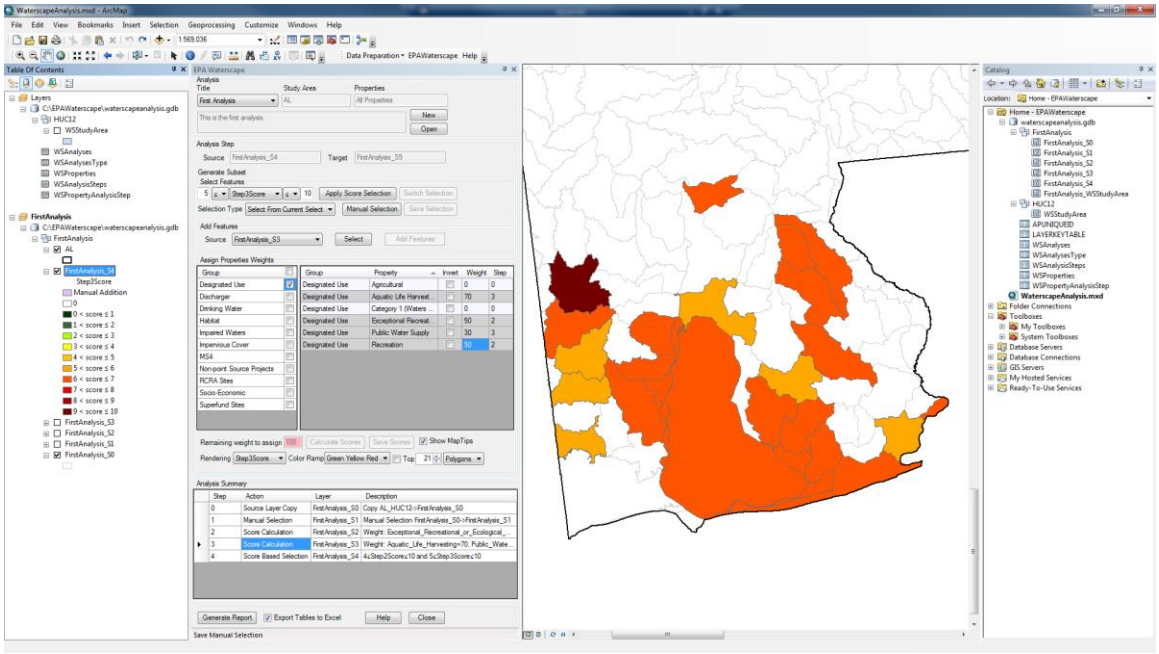


Figure 2-36 – Results after Second Subset

The step is written to the Analysis Summary table as a Score Based Selection.

Analysis Summary

	Step	Action	Layer	Description
▶	0	Source Layer Copy	FirstAnalysis_S0	Copy AL_HUC12->FirstAnalysis_S0
	1	Manual Selection	FirstAnalysis_S1	Manual Selection FirstAnalysis_S0->FirstAnalysis_S1
	2	Score Calculation	FirstAnalysis_S2	Weight: Exceptional_Recreational_or_Ecological_Significance=50, Recreation=50
	3	Score Calculation	FirstAnalysis_S3	Weight: Aquatic_Life_Harvesting=70, Public_Water_Supply=30
	4	Score Based Selection	FirstAnalysis_S4	4≤Step2Score≤10 and 5≤Step3Score≤10

Figure 2-37 – Analysis Summary after Step 4

2.7 Add back Features

This step allows adding back features that are not in the subset.

- Specify the source feature class from which the features will be added. '*_S0' contains all features from the original study area. Select FirstAnalysis_S3 and click Select.

Figure 2-38 – Add Features Source

The layer FirstAnalysis_S3 is now visible and selectable. Any existing selected set is cleared in the layer.

- Set the Selection Type to 'Add to Current Selection' and click on the map to select the features from the layer FirstAnalysis_S3 to add back in the new subset feature class (FirstAnalysis_S5).

- Once you are done with selecting the features to add back, click Add Features.

- Enter a description for the step when prompted and click OK to create the new subset FirstAnalysis_S5 generated by copying the current analysis feature class (FirstAnalysis_S4) and appending the selected features from the source feature class FirstAnalysis_S3.

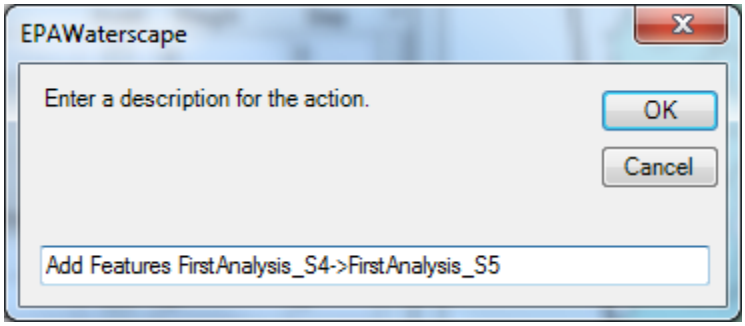


Figure 2-39 – Add Features Step Description

Analysis Summary

	Step	Action	Layer	Description
▶	0	Source Layer Copy	FirstAnalysis_S0	Copy AL_HUC12->FirstAnalysis_S0
	1	Manual Selection	FirstAnalysis_S1	Manual Selection FirstAnalysis_S0->FirstAnalysis_S1
	2	Score Calculation	FirstAnalysis_S2	Weight: Recreation=50, Exceptional_Recreational_or_Ecological_Significance=50
	3	Score Calculation	FirstAnalysis_S3	Weight: Public_Water_Supply=30, Aquatic_Life_Harvesting=70
	4	Score Based Selection	FirstAnalysis_S4	4≤Step2Score≤10 and 5≤Step3Score≤10
	5	Add Features	FirstAnalysis_S5	Add Features FirstAnalysis_S4->FirstAnalysis_S5

Figure 2-40 – Analysis Summary – Add Features

Note
If the source layer does not contain some of the score fields, these fields will be populated with -9999 in the target layer and displayed as a Manual Addition.

2.8 Select Top 10 Polygons using Last Score

You have the option to select the select the top polygons using either a number or a percentage.

The status bar at the bottom of the form return the following expression:

Requested Top 10 Polygons of 37, 17 returned (15 ties) with minimum Step3Score=7

Or

The status bar at the bottom of the form return the following expression:

Requested Top 10% of 37 (Top 4), 17 returned (15 ties) with minimum Step3Score=7

When the Top checkbox is checked, a Definition Query is applied to the layer so that only the top polygons are displayed. The lower threshold under Select Features is updated with the value of the minimum score associated to the top scores.

If you want to save the top features, you need to create a new subset (FirstAnalysis_S6) by selecting Apply Score Selection (with the Selection Type set to "Create New Selection") and Save Selection.

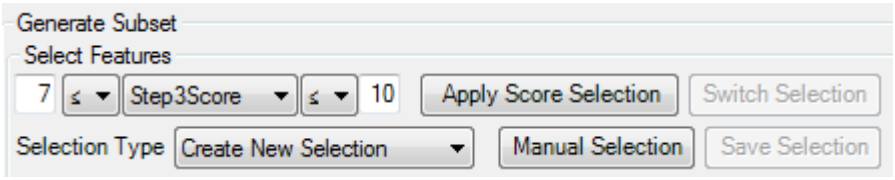


Figure 2-41 – Selection based on Minimum Top Score

Edit the step's description as needed and click OK.

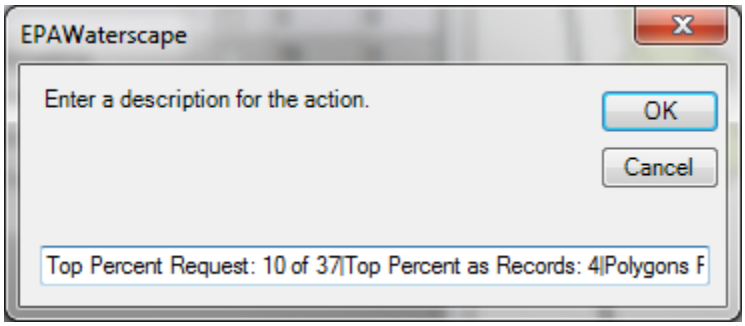


Figure 2-42 – Top Percent Request

The step is written to the Analysis Summary table as Action Type "Top Score Selection".

Analysis Summary

Step	Action	Layer	Description
0	Source Layer Copy	FirstAnalysis_S0	Copy AL_HUC12->FirstAnalysis_S0
1	Manual Selection	FirstAnalysis_S1	Manual Selection FirstAnalysis_S0->FirstAnalysis_S1
2	Score Calculation	FirstAnalysis_S2	Weight: Exceptional_Recreational_or_Ecological_Significance=50, Recreation=50
3	Score Calculation	FirstAnalysis_S3	Weight: Aquatic_Life_Harvesting=70, Public_Water_Supply=30
4	Score Based Selection	FirstAnalysis_S4	4≤Step2Score≤10 and 5≤Step3Score≤10
5	Add Features	FirstAnalysis_S5	Add Features FirstAnalysis_S4->FirstAnalysis_S5
6	Top Score Selection	FirstAnalysis_S6	Top Percent Request: 10 of 37|Top Percent as Records: 4|Polygons Returned (including 15 ties): 17|Minimum Step3Score Returned: 7

Figure 2-43 – Top Score Selection Action Type

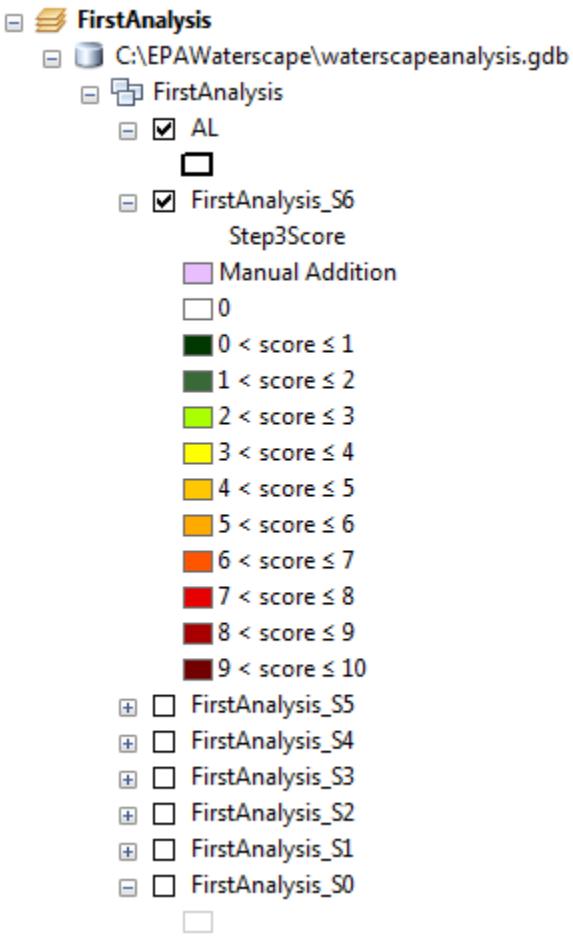


Figure 2-44 – Top Score Layer Rendered using last computed Score

2.9 Generate Report

There are 2 options for generating reports:

- Microsoft Word Only.
- Microsoft Word for metadata and maps and Microsoft Excel for tables.

To export the tables to Excel instead of Word, the Export Tables to Excel checkbox must be checked.

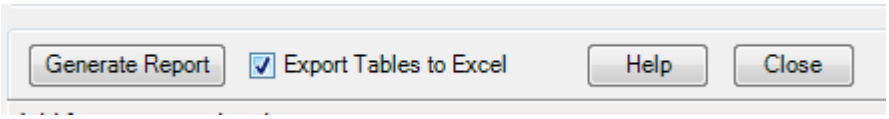


Figure 2-45 – Generate Reports Option

- Click Generate Report.

Report(s) are generated in the same location as the map document. Their name is built by appending the date and time to the second to the name of the analysis.

The ReportImages folder contains the images inserted into the Word Document.

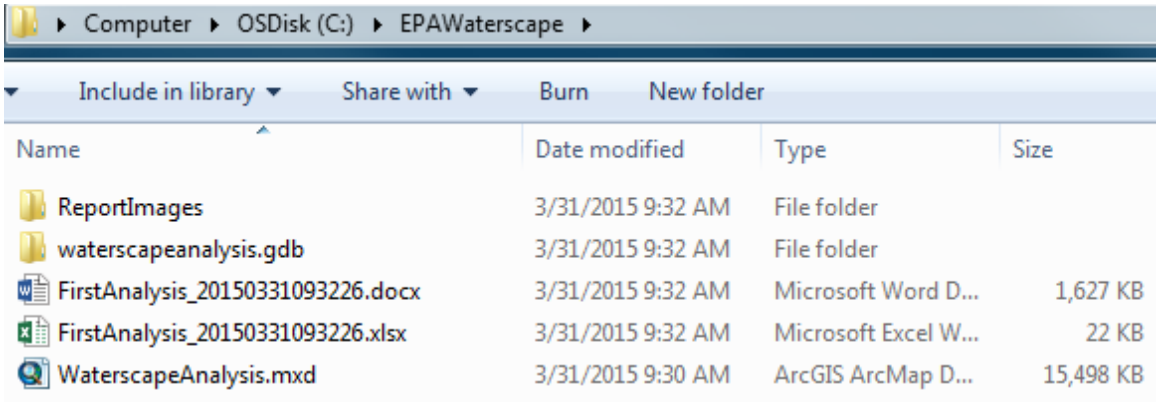
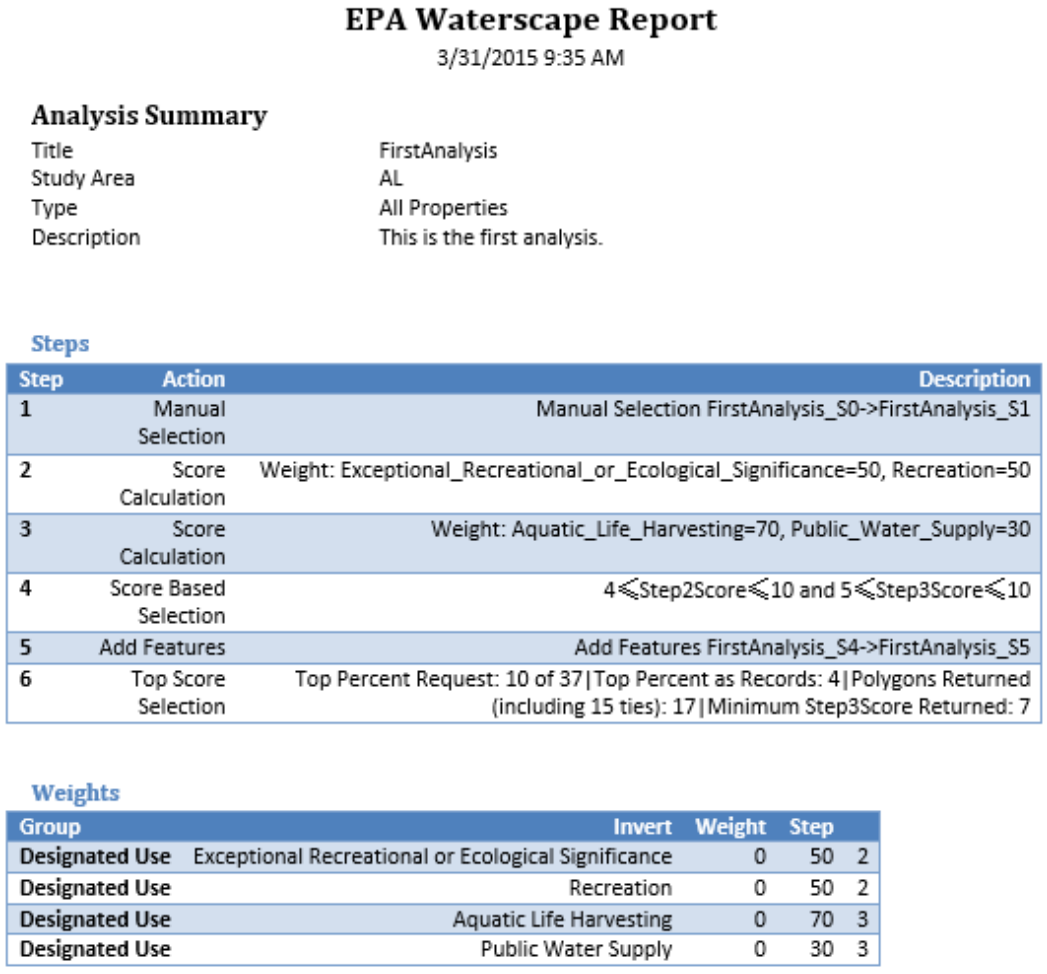


Figure 2-46 – First Analysis Report

The Word document first provides the summary of the analysis, with its title, study area, type and description.
Then it lists the steps performed in the analysis and their respective weight assignments.



EPA Waterscape Report

3/31/2015 9:35 AM

Analysis Summary

Title	FirstAnalysis
Study Area	AL
Type	All Properties
Description	This is the first analysis.

Steps

Step	Action	Description
1	Manual Selection	Manual Selection FirstAnalysis_S0->FirstAnalysis_S1
2	Score Calculation	Weight: Exceptional_Recreational_or_Ecological_Significance=50, Recreation=50
3	Score Calculation	Weight: Aquatic_Life_Harvesting=70, Public_Water_Supply=30
4	Score Based Selection	4≤Step2Score≤10 and 5≤Step3Score≤10
5	Add Features	Add Features FirstAnalysis_S4->FirstAnalysis_S5
6	Top Score Selection	Top Percent Request: 10 of 37|Top Percent as Records: 4|Polygons Returned (including 15 ties): 17|Minimum Step3Score Returned: 7

Weights

Group		Invert	Weight	Step	
Designated Use	Exceptional Recreational or Ecological Significance	0	50	2	
Designated Use	Recreation	0	50	2	
Designated Use	Aquatic Life Harvesting	0	70	3	
Designated Use	Public Water Supply	0	30	3	

Figure 2-47 – Report Summary Tables

The summary section is followed by a summary map showing the final results of the analysis.

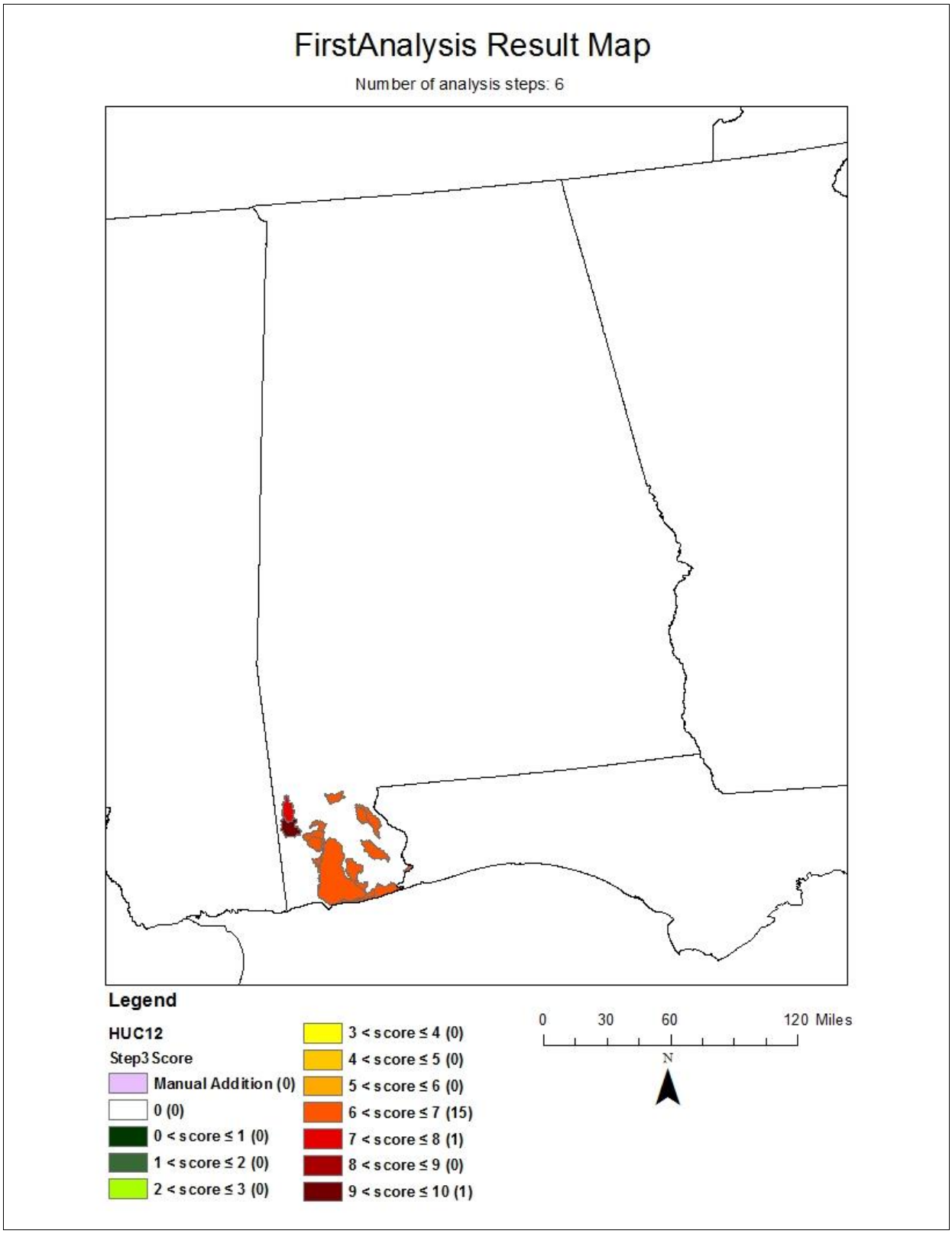


Figure 2-48 – Summary Map

The Word document includes a map for each step.

Step 6 - Top Score Selection

Top Percent Request: 10 of 37

Top Percent as Records: 4

Polygons Returned (including 15 ties): 17

Minimum Step3Score Returned: 7

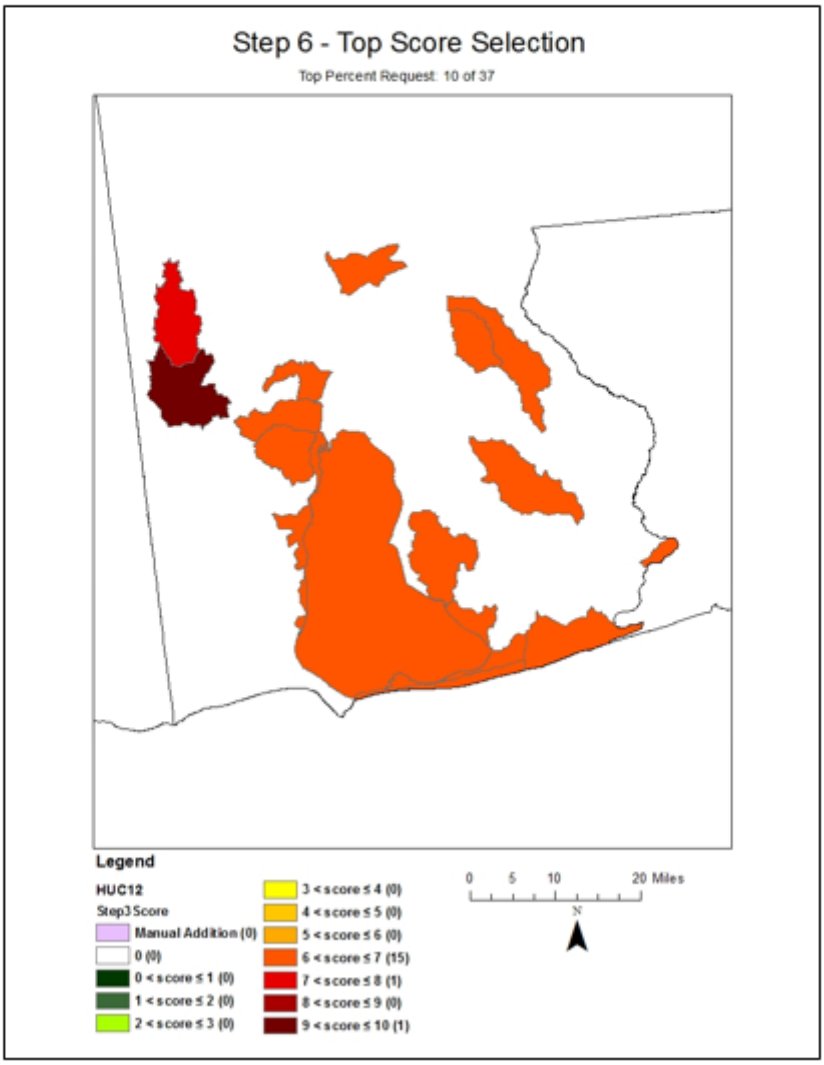
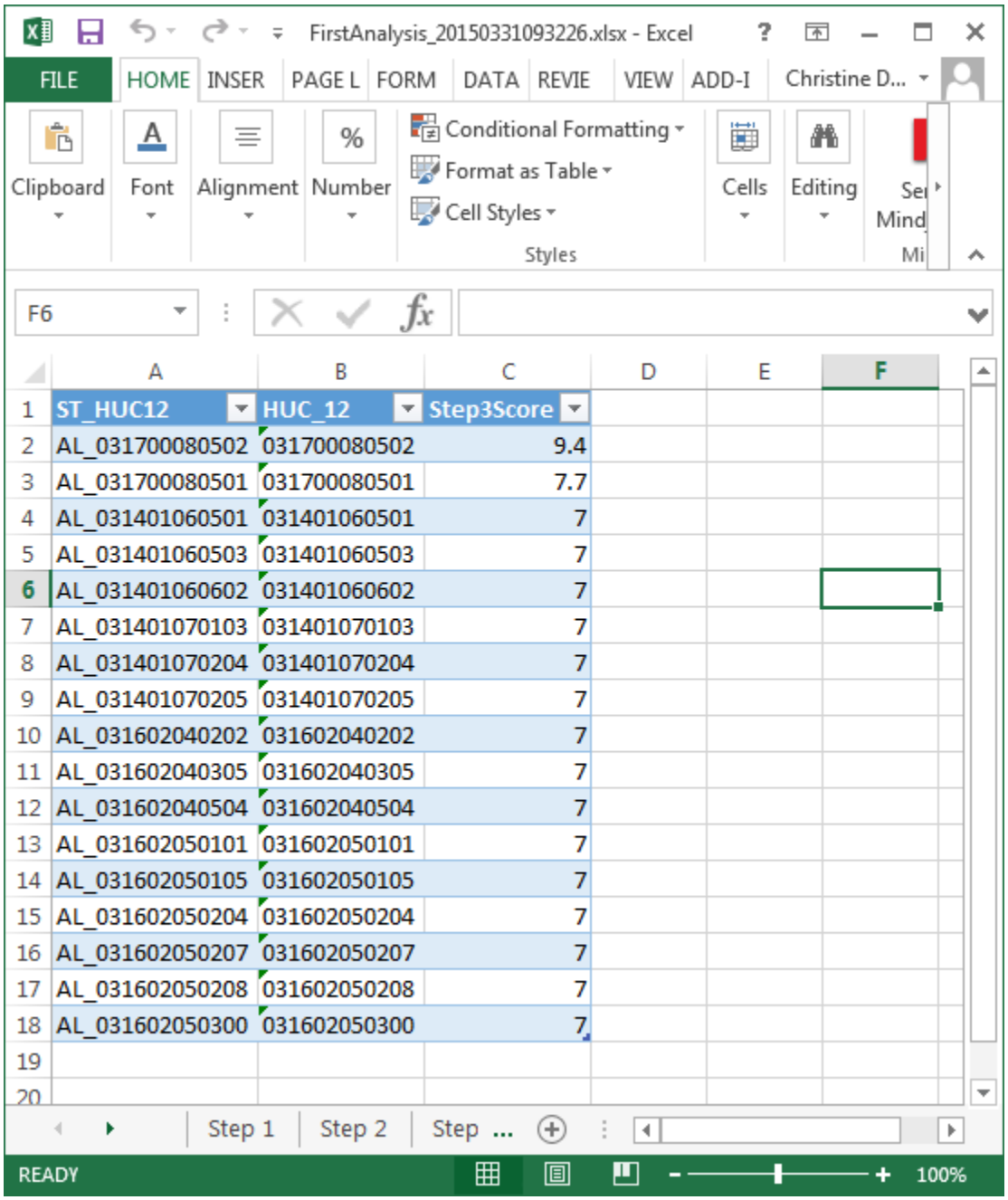


Figure 2-49 – Map for specific Step

The Excel Spreadsheet contains the records for each step with the associated scores when relevant (only records with values <> 0 are displayed).



	A	B	C	D	E	F
1	ST_HUC12	HUC_12	Step3Score			
2	AL_031700080502	031700080502	9.4			
3	AL_031700080501	031700080501	7.7			
4	AL_031401060501	031401060501	7			
5	AL_031401060503	031401060503	7			
6	AL_031401060602	031401060602	7			
7	AL_031401070103	031401070103	7			
8	AL_031401070204	031401070204	7			
9	AL_031401070205	031401070205	7			
10	AL_031602040202	031602040202	7			
11	AL_031602040305	031602040305	7			
12	AL_031602040504	031602040504	7			
13	AL_031602050101	031602050101	7			
14	AL_031602050105	031602050105	7			
15	AL_031602050204	031602050204	7			
16	AL_031602050207	031602050207	7			
17	AL_031602050208	031602050208	7			
18	AL_031602050300	031602050300	7			
19						
20						

Figure 2-50 – Resulting Excel Spreadsheet

2.10 Delete Analysis Step(s)

You can delete one or more steps from the analysis if needed.

- In the Analysis Summary table click the desired Analysis Summary step and make sure the name of the step appears at the bottom of the form. Then, right-click the step you want to delete (note that all subsequent steps will also be

deleted) and choose to 'Create New Analysis from the current step' or to 'Delete Selected and Subsequent Steps' from the context menu.

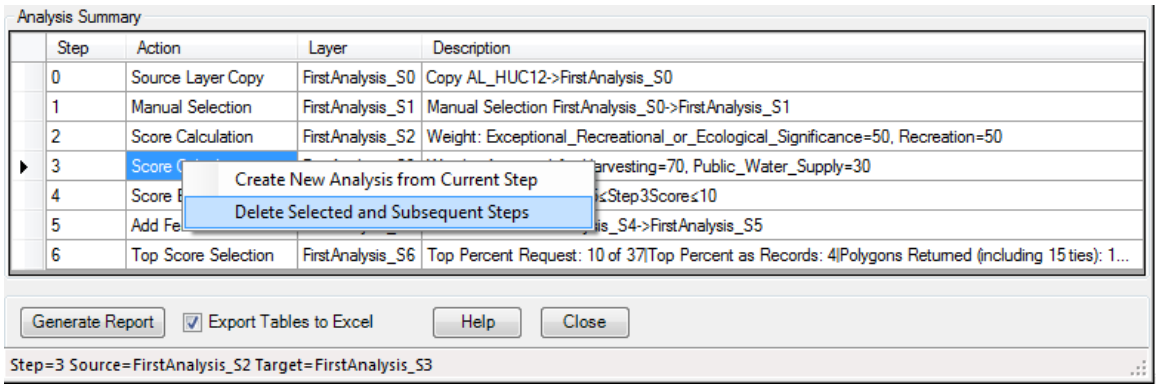


Figure 2-51 - Delete Selected and Subsequent Steps

The layers associated with the selected step and subsequent steps (3 and higher) are removed from the map and deleted from the geodatabase.

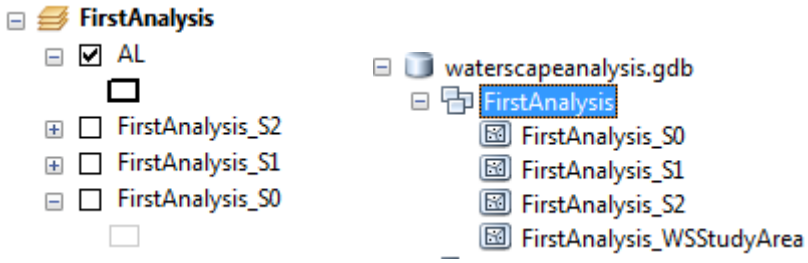


Figure 2-52 – Remaining Layers after Deletion

2.11 Create Analysis from existing Analysis

You can create a new analysis based on an existing analysis or based on specific steps from an existing analysis.

- Select the existing analysis to use as a source for the new Analysis and click Open to open it.

- Left click the last step you want to include in your analysis to select the record, then right click and select Create New Analysis from Current Step in the context menu

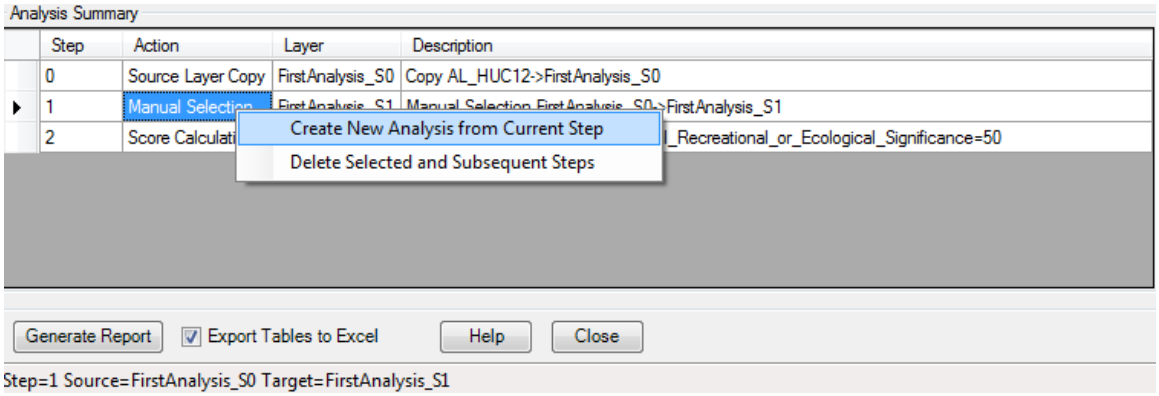


Figure 2-53 – Create New Analysis from Current Step

- Enter a name and description for the new analysis when prompted and click Create to generate the new analysis.

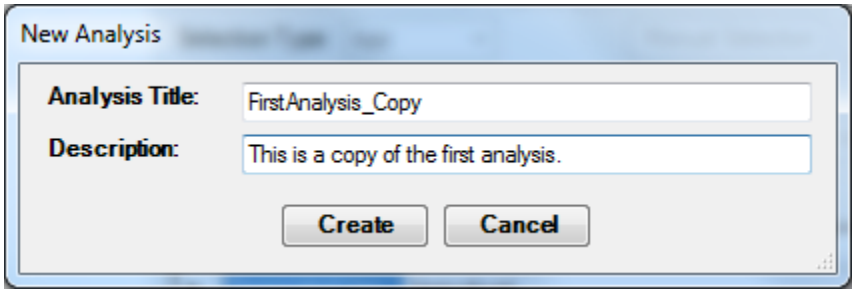


Figure 2-54 – New Analysis Window

3. Setting up custom Data

Instead of using the preloaded database, you have the option to use your own data to perform the analyses. Two functions allow you to generate the base data required to perform analyses. These two functions are located in the Data Preparation menu in the EPA Waterscape toolbar.

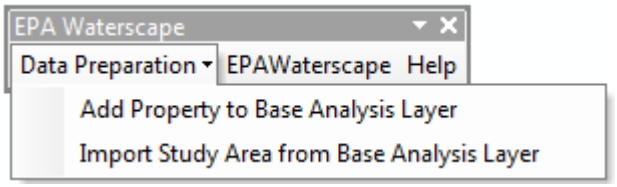


Figure 3-1 – Data Preparation Menu

The default database must not be loaded when setting up custom data. So the EPAWaterscape button which loads this database must not be used until the data has been set up.

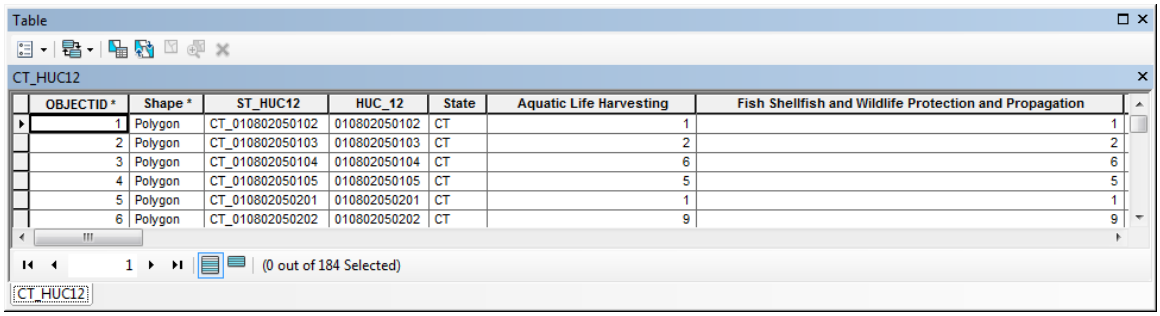
3.1 Defining your Base Analysis Layer

The Base Analysis Layer is the polygon feature class storing the polygon features for which the properties of interest have been calculated. For example, the default Base Analysis Layer used in the EPA Waterscape application is a snapshot of the Watershed Boundary Dataset that has been intersected with a particular US state file to include water-based state areas that are covered by WBD HUC12 features.
Properties have been assessed for each of these polygons. The name of the layer is HUC12_dtl_st_with_water_INTERSECT.

Figure 3-2 – Default Base Analysis Layer

Note
This layer is not installed with the EPA Waterscape Tools.

Instead of using this layer, you also have the option to use a State level base layer. These layers are installed by the EPA Waterscape tool and are the default layers supporting the analyses. The State Level layer contains the same non property attributes as the source Base Layer. It also contains the properties that have at least one value greater than 0.



OBJECTID *	Shape *	ST_HUC12	HUC_12	State	Aquatic Life Harvesting	Fish Shellfish and Wildlife Protection and Propagation
1	Polygon	CT_010802050102	010802050102	CT	1	1
2	Polygon	CT_010802050103	010802050103	CT	2	2
3	Polygon	CT_010802050104	010802050104	CT	6	6
4	Polygon	CT_010802050105	010802050105	CT	5	5
5	Polygon	CT_010802050201	010802050201	CT	1	1
6	Polygon	CT_010802050202	010802050202	CT	9	9

Figure 3-3 – State Level Supporting Layer

It has as well 2 administration fields: AnalysisZoneID and AnalysisZoneName that are the same as respectively the fields HUC_12 and ST_HUC12.

Table

CT_HUC12

CWA Section 319 Non-point Source Projects	Shape_Length	Shape_Area	AnalysisZoneID	AnalysisZoneName
0	28863.809938	25935369.390608	CT_010802050102	010802050102
0	30258.151336	29104693.070633	CT_010802050103	010802050103
0	52877.02518	63415056.204644	CT_010802050104	010802050104
0	69981.468195	102106679.484513	CT_010802050105	010802050105
0	38509.165859	47179937.141241	CT_010802050201	010802050201
5	35313.665644	40869628.280832	CT_010802050202	010802050202

0 (0 out of 184 Selected)

CT_HUC12

Figure 3-4 – Administration Fields

Figure 3-5 – State Level Supporting Geometry

3.2 Generate New Properties

New properties must geographically conform to the base layer used in the EPAWaterscape tool. All geoprocessing of data intended to supplement the stock EPAWaterscape layers needs to be done with the exact same geography used in creating the properties that come with the tool.

The output from the processing need to be a table that has a 'State_HUC12" field and a "score" field. The state field will be the two letter abbreviation "CT", an underscore, and then the 12-digit HUC ID (e.g. "CT_010203040506"). Your score field is the intrinsic scale or value assigned to each feature based on the raw data (e.g. '1-10', '2,4,6,8,10', etc.). With those two fields

created, the Add Properties to Base Analysis Layer tool can join your simple table to the base geography and allows you to utilize your data in the EPAWaterscape tool.

3.3 Add Properties to Base Analysis Layer

The objective of this function is to append new property fields to the base analysis polygon layer containing all polygon features that have been scored.

- Open a new map document and save it.
- Add your polygon base analysis layer into the Table of Contents of ArcMap.
- Add the table storing the properties that have been calculated for the features. For each property, an intrinsic score of 1-10 was assigned to each HUC12 with that property present in a given state on the basis of the distribution of the data within the property.

3.3.1 Add and Rename Single Property

To add a property to the Base Analysis Layer use the function Add Property to Base Analysis Layer. This function replaces the null values with zeros and also provides an entry for renaming the new property if the user so desires.

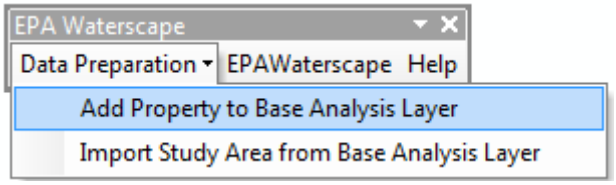


Figure 3-6 – Add Property to Base Analysis Layer

- Select Data Preparation > Add Property to Base Analysis Layer.

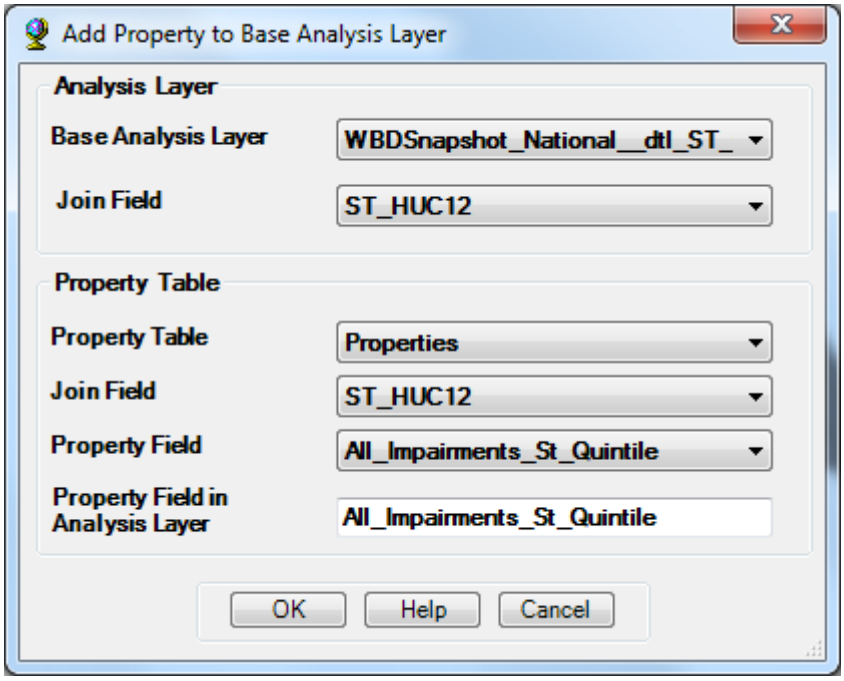


Figure 3-7 - Add Property to Base Analysis Layer Form

Note
This tool processes only one field at the time.

3.3.2 Add Multiple Properties

If you want to process multiple fields without renaming them, you can use the out-of-the box Join Field tool to add the fields from the properties table as is in the Base Analysis Layer. You will need to replace the null values with zeros in the properties table first before performing the join.

3.3.2.1 Replace Null values in Properties Table (optional)

The input properties table contain on field for each property. If there are Null values associated to the properties, these values must be set to 0. This may be done using the EPA Waterscape toolbox Replace Null with Zero tool.

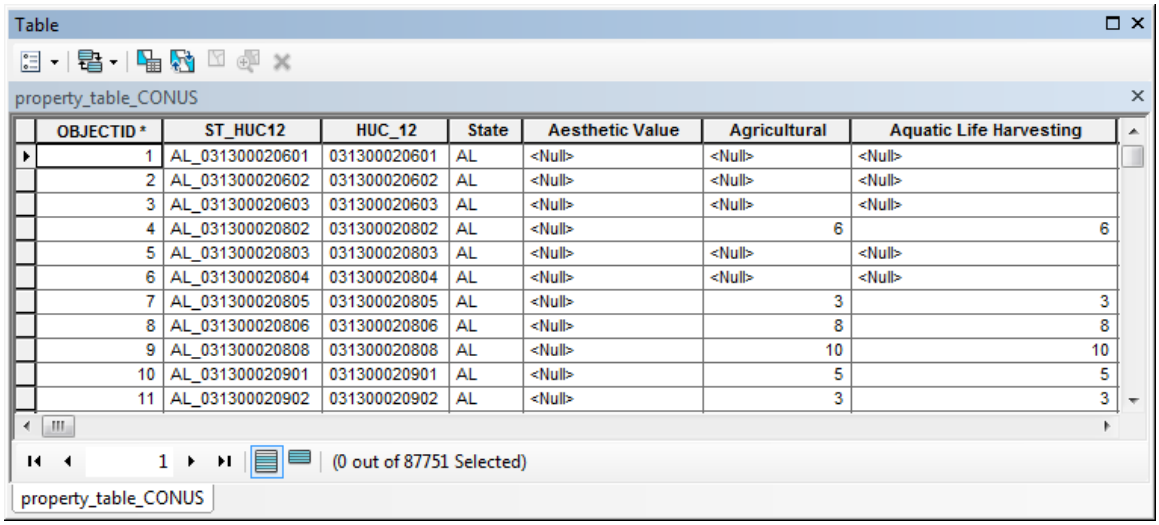


Figure 3-8 – Input Properties Table for update

- Add the input Properties table to ArcMap.
- Open the Catalog window and browse to the location of the EPA Waterscape toolbox located by default under C:\Program Files (x86)\ESRI\EPAWaterscape\Bin.

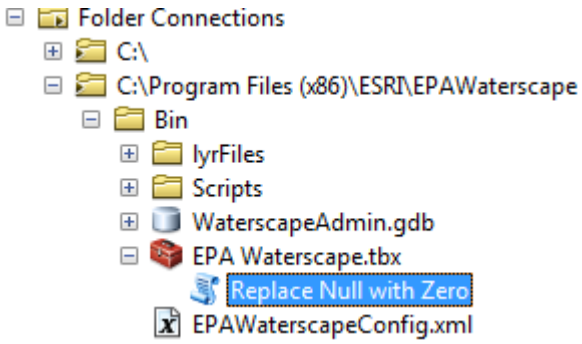


Figure 3-9 – Replace Null with Zero tool

- Double-click the Replace Null with Zero tool. Set the Input Properties Table to your updated Properties table and create an output Properties table in the same location. Click OK to run the tool.

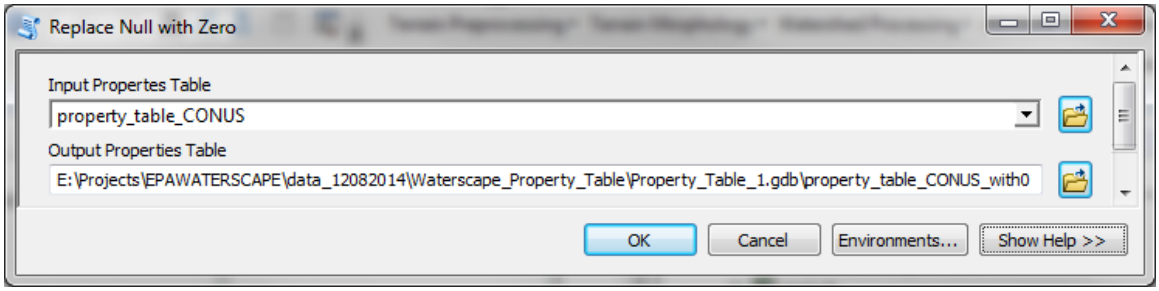


Figure 3-10 – Replace Null with Zero User Interface

The updated table contains 0 values instead of Null values in the properties fields.

3.3.2.2 Cleanup Base Analysis Layer (optional)

You need to remove from the Base Analysis Layer any existing property fields that you want to upload if they already exist. You can use the Delete Field geoprocessing tool to delete specific attributes.

- If the input Base Analysis Layer already contains some of the properties you want to upload/update, browse to the Delete Fields tool in the Data Management toolbox.

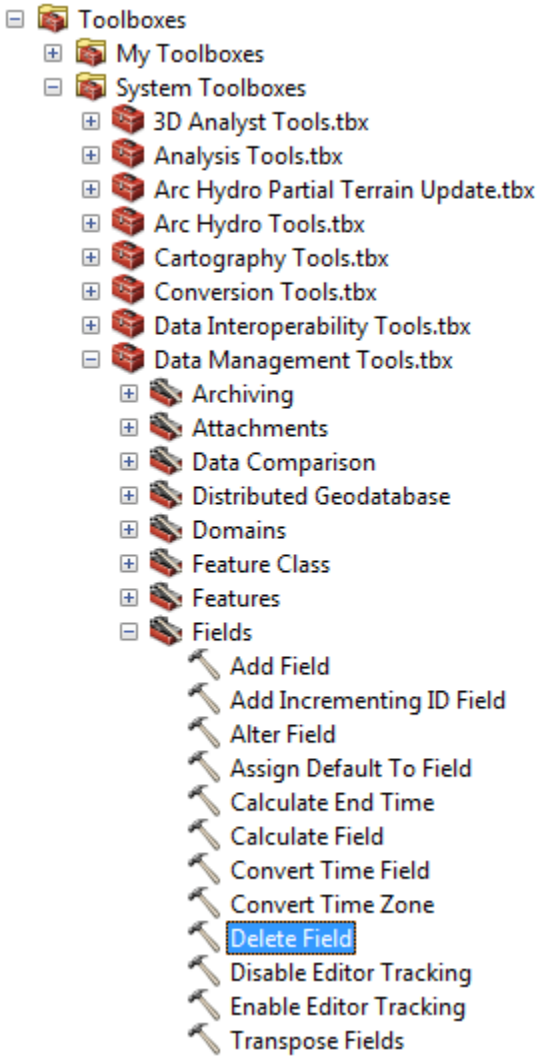


Figure 3-11 – Delete Field Tool

- Double-click the tool. Select the Base Analysis layer as input table and select the properties fields to delete. Do not delete the identifier fields.

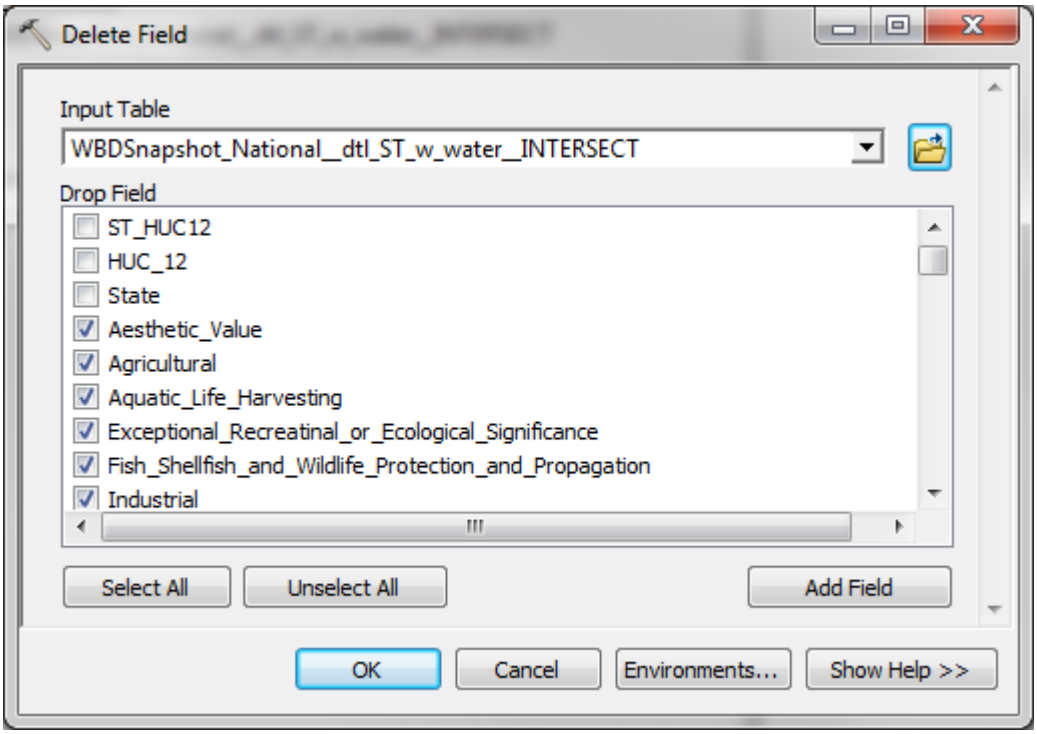
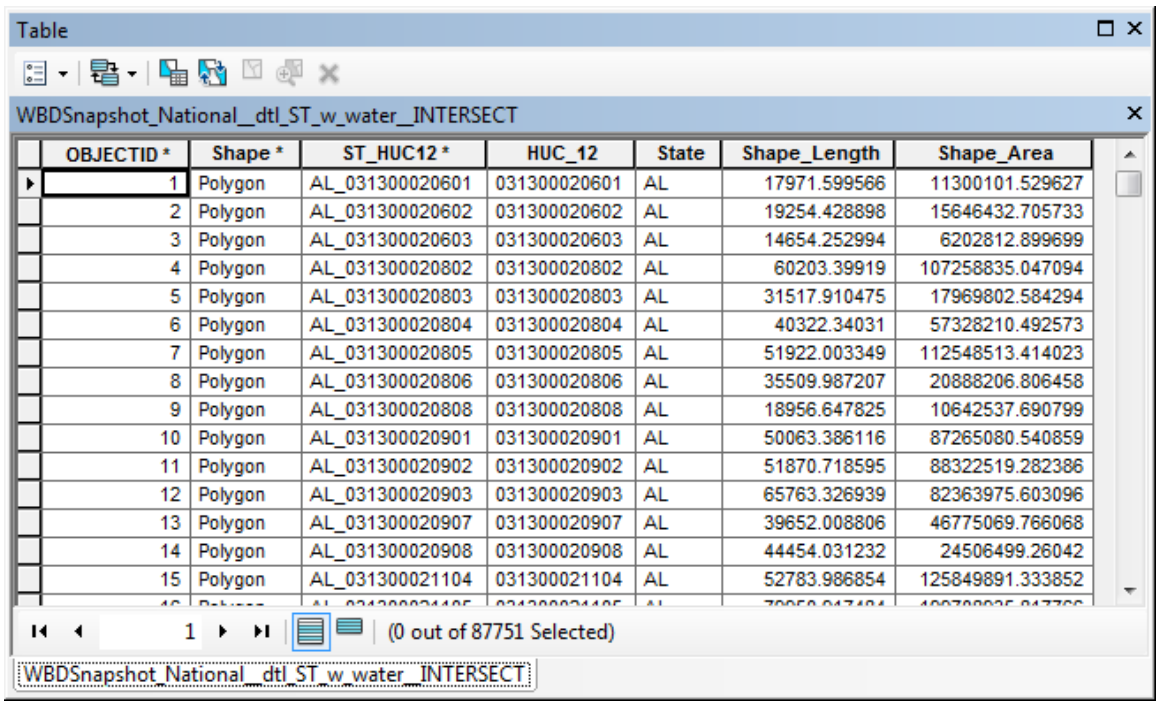


Figure 3-12 – Delete Existing Properties Fields from Base Analysis Layer



OBJECTID *	Shape *	ST_HUC12 *	HUC_12	State	Shape_Length	Shape_Area
1	Polygon	AL_031300020601	031300020601	AL	17971.599566	11300101.529627
2	Polygon	AL_031300020602	031300020602	AL	19254.428898	15646432.705733
3	Polygon	AL_031300020603	031300020603	AL	14654.252994	6202812.899699
4	Polygon	AL_031300020802	031300020802	AL	60203.39919	107258835.047094
5	Polygon	AL_031300020803	031300020803	AL	31517.910475	17969802.584294
6	Polygon	AL_031300020804	031300020804	AL	40322.34031	57328210.492573
7	Polygon	AL_031300020805	031300020805	AL	51922.003349	112548513.414023
8	Polygon	AL_031300020806	031300020806	AL	35509.987207	20888206.806458
9	Polygon	AL_031300020808	031300020808	AL	18956.647825	10642537.690799
10	Polygon	AL_031300020901	031300020901	AL	50063.386116	87265080.540859
11	Polygon	AL_031300020902	031300020902	AL	51870.718595	88322519.282386
12	Polygon	AL_031300020903	031300020903	AL	65763.326939	82363975.603096
13	Polygon	AL_031300020907	031300020907	AL	39652.008806	46775069.766068
14	Polygon	AL_031300020908	031300020908	AL	44454.031232	24506499.26042
15	Polygon	AL_031300021104	031300021104	AL	52783.986854	125849891.333852

Figure 3-13 – Base Analysis Layer with all Properties Removed

3.3.2.3 Join Properties into Base Analysis Layer

- In ArcMap, open the Catalog window and browse to the Data Management Tools > Joins toolset. Double-click the Join Field tool.

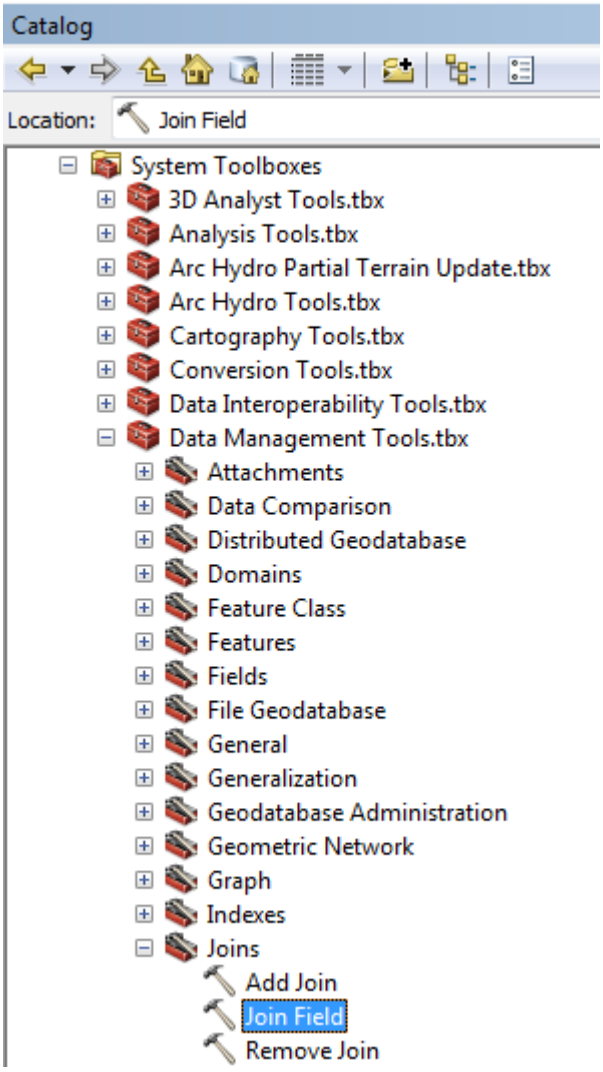


Figure 3-14 - Join Field Geoprocessing Tool

- Specify your Base Analysis Layer as Input Table and your Properties table as Join Table as well as the Input and Output Join Fields.

- Specify the fields used to establish the relationship between the Base Analysis Layer and the Properties table (e.g. ST_HUC12).

- Check the Property fields to add in the Base Analysis Layer and click OK.

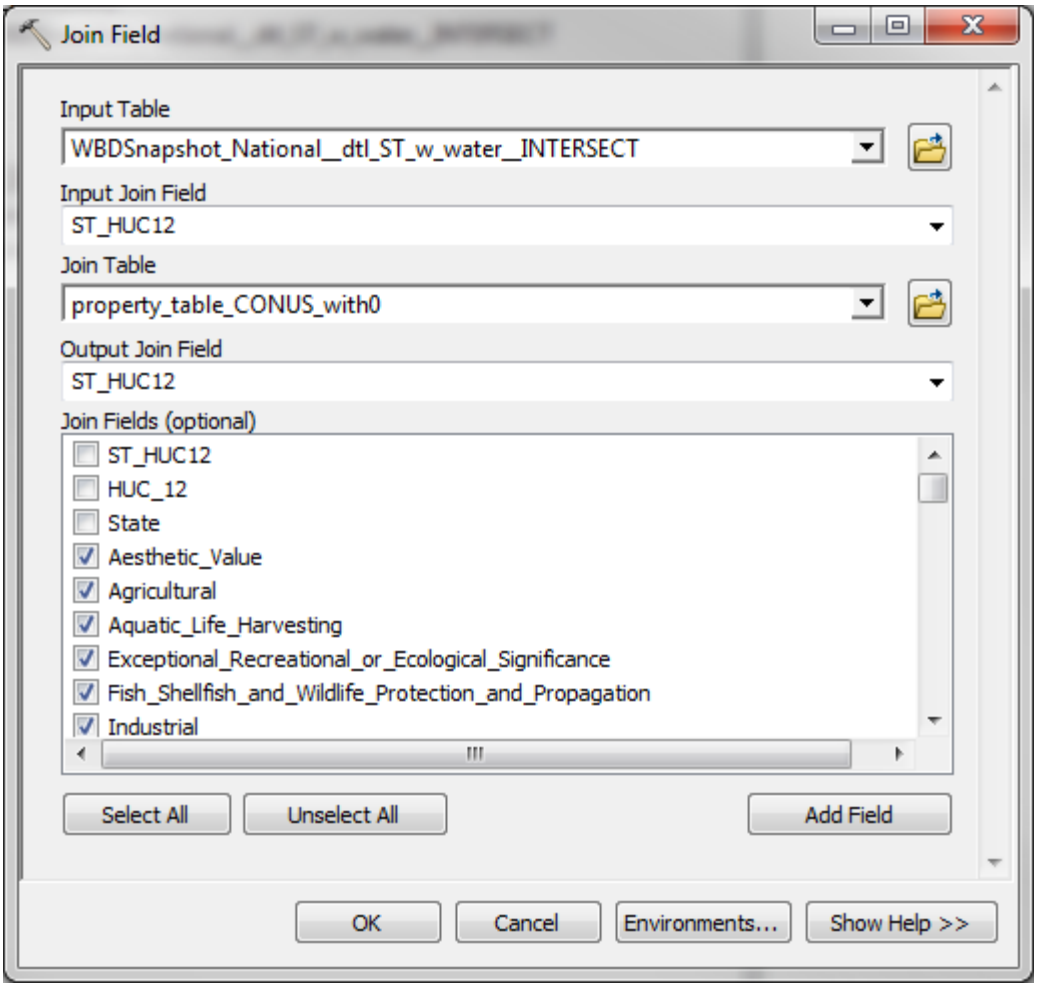
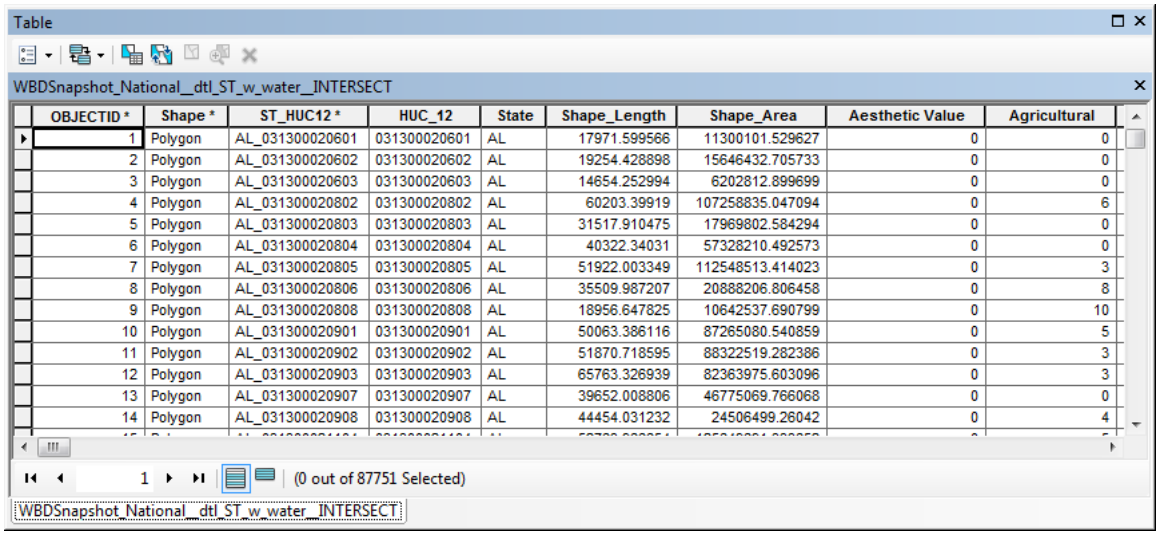


Figure 3-15 – Join Field Geoprocessing Tool User Interface

The selected Properties have been added to the Base Analysis Layer.



OBJECTID *	Shape *	ST_HUC12 *	HUC_12	State	Shape_Length	Shape_Area	Aesthetic Value	Agricultural
1	Polygon	AL_031300020601	031300020601	AL	17971.599566	11300101.529627	0	0
2	Polygon	AL_031300020602	031300020602	AL	19254.428898	15646432.705733	0	0
3	Polygon	AL_031300020603	031300020603	AL	14654.252994	6202812.899699	0	0
4	Polygon	AL_031300020802	031300020802	AL	60203.39919	107258835.047094	0	6
5	Polygon	AL_031300020803	031300020803	AL	31517.910475	17969802.584294	0	0
6	Polygon	AL_031300020804	031300020804	AL	40322.34031	57328210.492573	0	0
7	Polygon	AL_031300020805	031300020805	AL	51922.003349	112548513.414023	0	3
8	Polygon	AL_031300020806	031300020806	AL	35509.987207	20888206.806458	0	8
9	Polygon	AL_031300020808	031300020808	AL	18956.647825	10642537.690799	0	10
10	Polygon	AL_031300020901	031300020901	AL	50063.386116	87265080.540859	0	5
11	Polygon	AL_031300020902	031300020902	AL	51870.718595	88322519.282386	0	3
12	Polygon	AL_031300020903	031300020903	AL	65763.326939	82363975.603096	0	3
13	Polygon	AL_031300020907	031300020907	AL	39652.008806	46775069.766068	0	0
14	Polygon	AL_031300020908	031300020908	AL	44454.031232	24506499.26042	0	4

Figure 3-16 – Base Analysis Layer with Joined Properties

3.4 Import Study Area from Base Analysis Layer

The objective of this function is to create subsets of StudyArea features contained in the base analysis layer (e.g., a single state) as well as the associated WSStudyArea feature class, WSProperties table and WSAnalysesType table used to support the analyses.

Warning
You must not click the EPAWaterscape tool if you plan to upload your custom data since this action will load the default configuration.

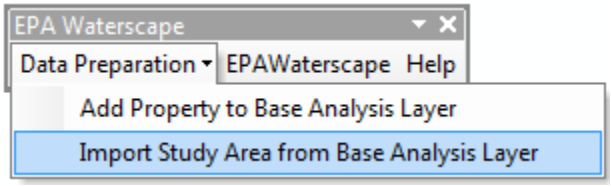


Figure 3-17 -– Import Study Area from Base Analysis Layer Function

- Select Data Preparation > Import Study Area from Base Analysis Layer.

- Specify the input Base Analysis Layer. Specify as Study Area Name Field and Study Area Code Field the fields that will be used to identify all features belonging to a specific Study Area. For example, the Base Analysis Layer used to generate the default database contains the field State that stores the 2-digit code of the State where the polygon feature is located. The Study Areas Code Field is used to name the output Base Analysis layer associated with each Study Area. The Layer Name suffix will be appended to this code.

- Specify as Analysis Zone ID Field the field storing the unique identifier for each input polygon feature that will be used in the reports. Specify as Analysis Zone Name Field the name field that will be used in the reports.

- Specify the Property fields that you want to use in your analyses. Modify the description if needed and enter a Property Group associated with each Property. The default Group is set to None.

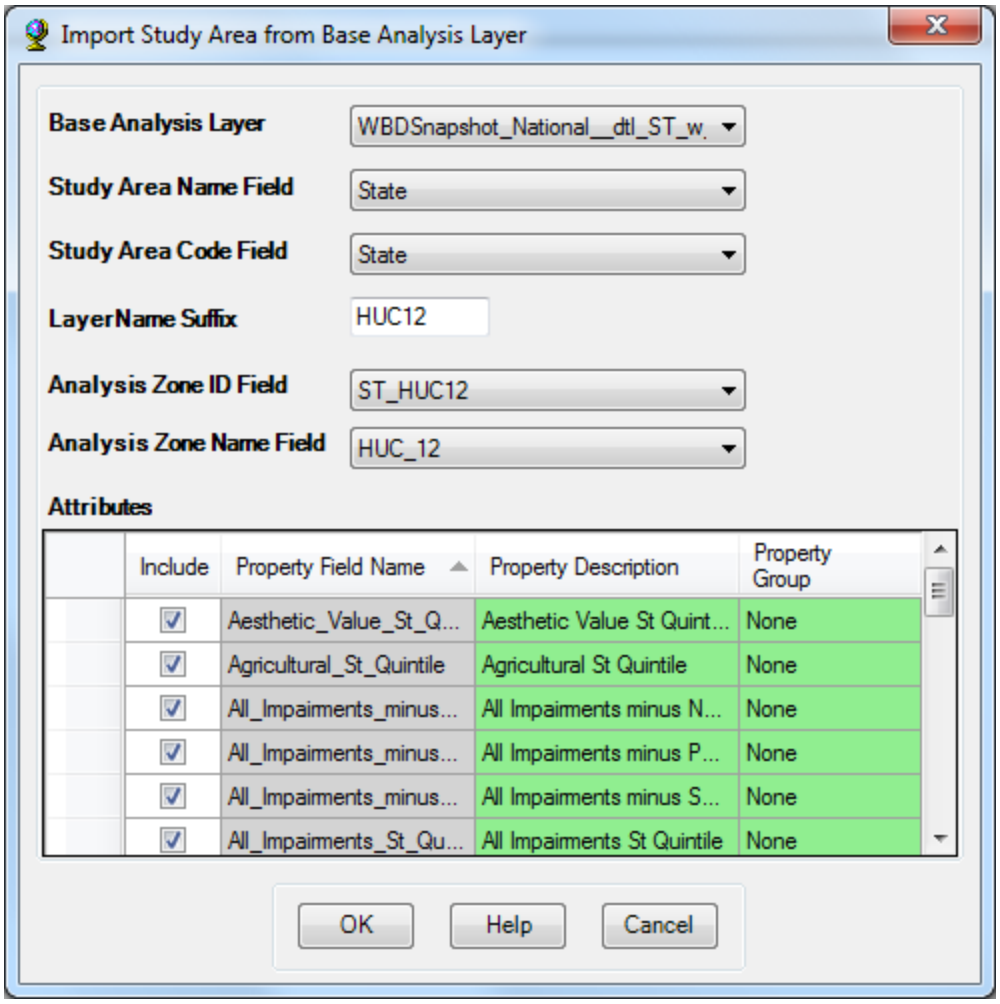


Figure 3-18 – Import Study Area from Base Analysis Layer

- You can either enter the Property Groups or leave the default (None) and modify the groups in the later step. Click OK.

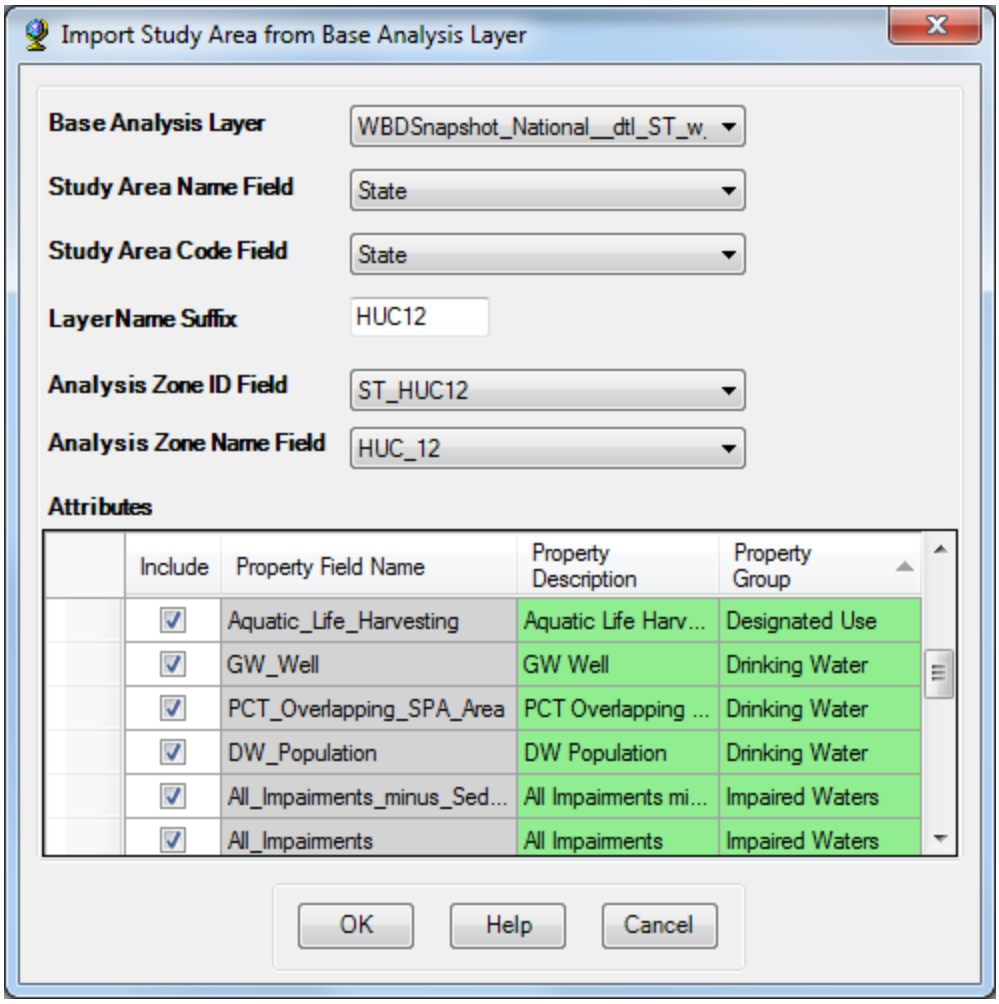


Figure 3-19 – Import Study Area from Base Analysis Layer with Property Groups Populated

The function creates an overview WS_STUDYAREA feature class storing the footprint of the available Study Areas. It also creates one polygon feature class for each StudyArea named by concatenating the Study Area Code, "_" and the Layer Name Suffix that contains the base polygon features from the input Base Analysis Layer that belong to the Study Area.

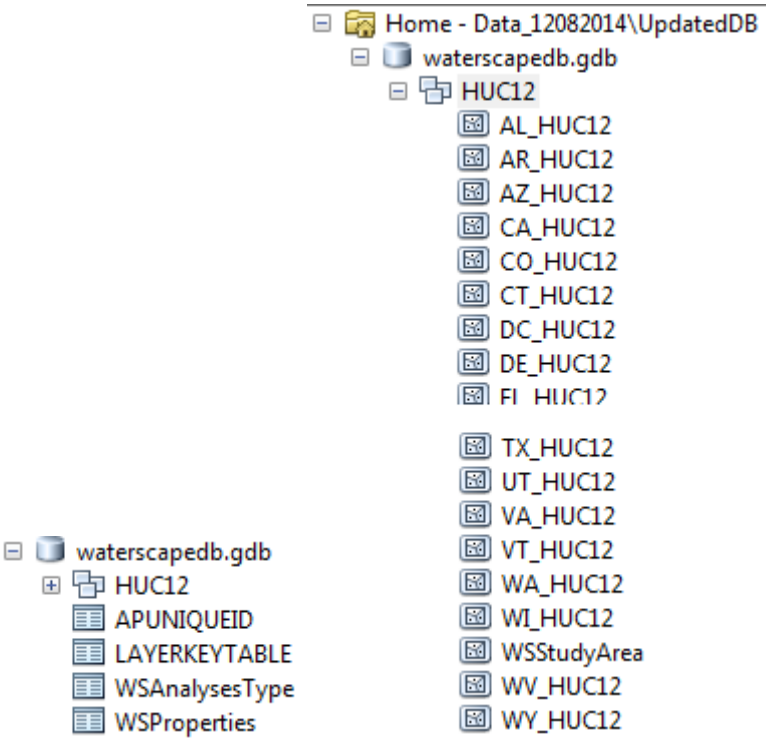


Figure 3-20 – Import Study Area from Base Analysis Layer Results

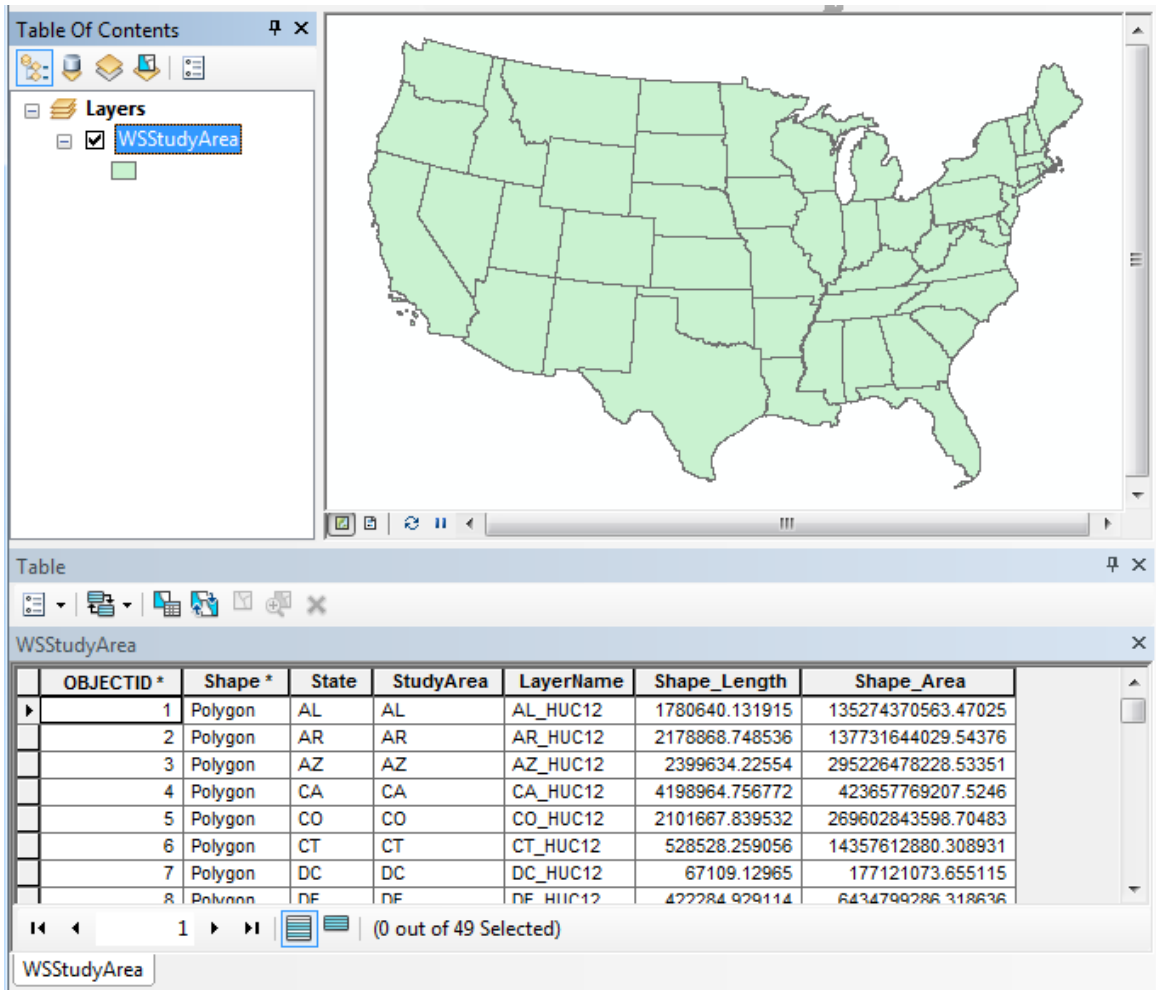


Figure 3-21 – WSStudyArea Feature Class

The function also creates one polygon feature class for each Study Area. Each feature class contains the base polygon features from the input Base Analysis Layer that belong to a specific Study Area. These feature classes are named by concatenating the Study Area Code, "_" and the Layer Name Suffix (e.g. AL_HUC12). Each feature class contains the fields AnalysisZoneID and AnalysisZoneName that will be used in the reports. They also contain all specified Properties that have least one value greater than zero in that Study Area.

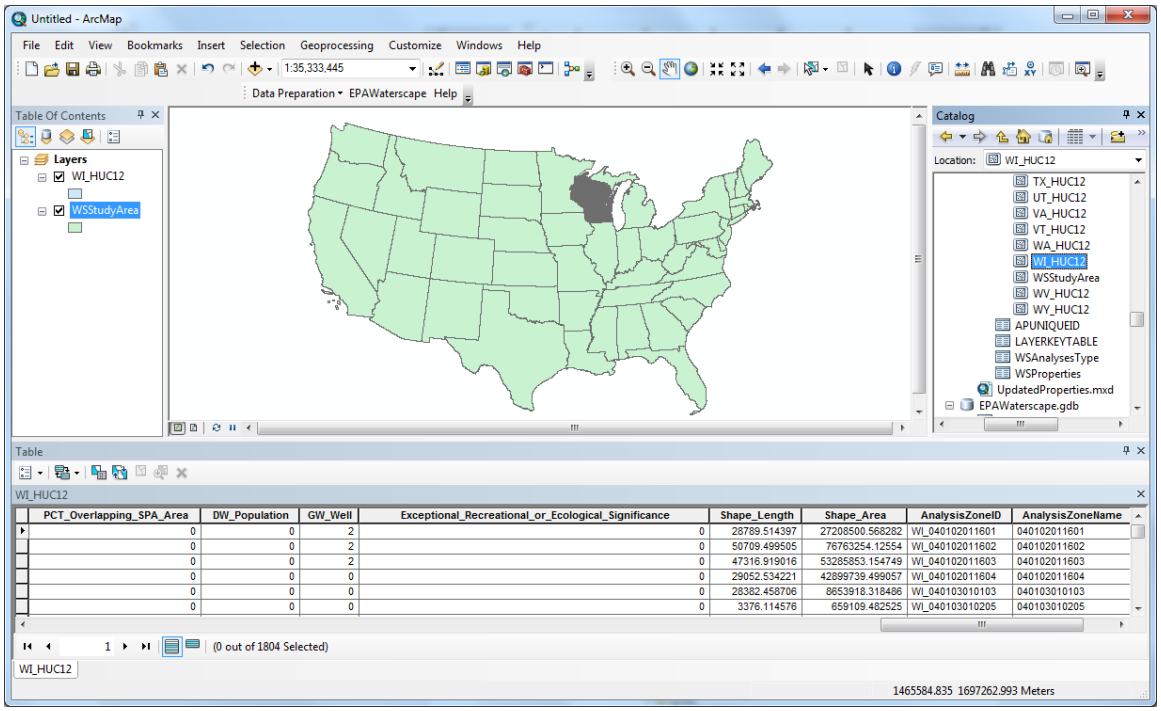


Figure 3-22 – Base Analysis Layer Features associated to a Study Area

The function creates and populates the WSProperties table with the checked Properties in the input form.

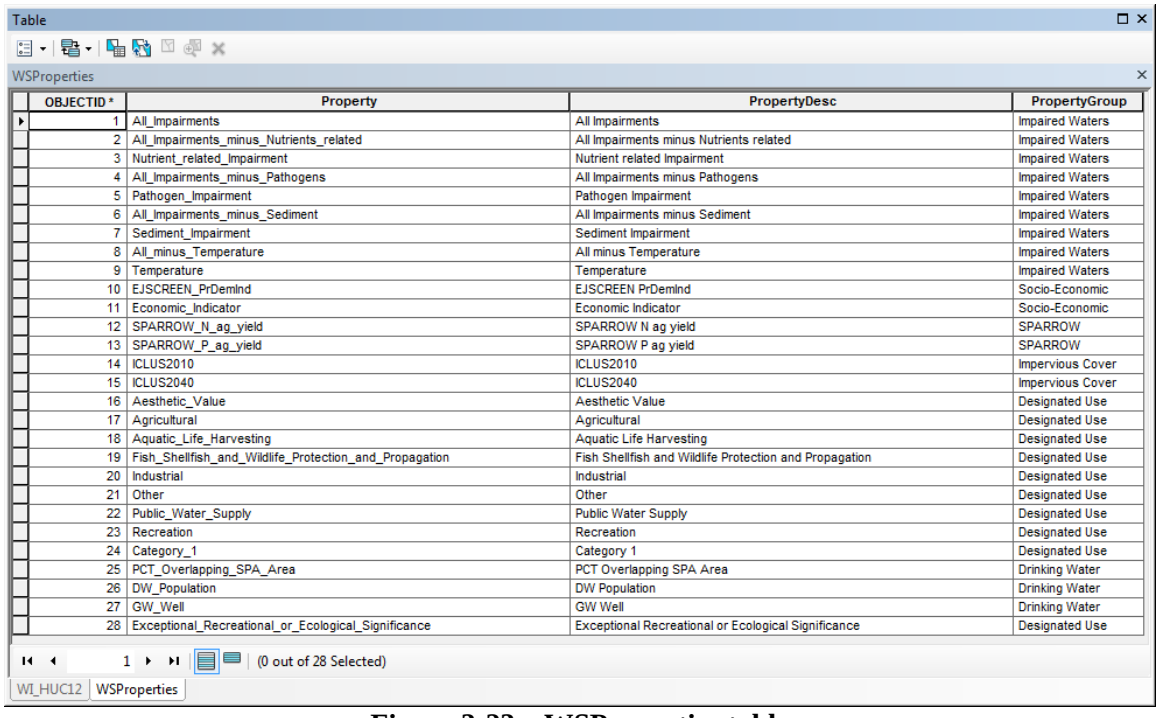


Figure 3-23 – WSProperties table

The function populates the WSAnalysisType table with the default "All Properties" AnalysisType that contains all Properties with non-zero values associated to the each StudyArea.

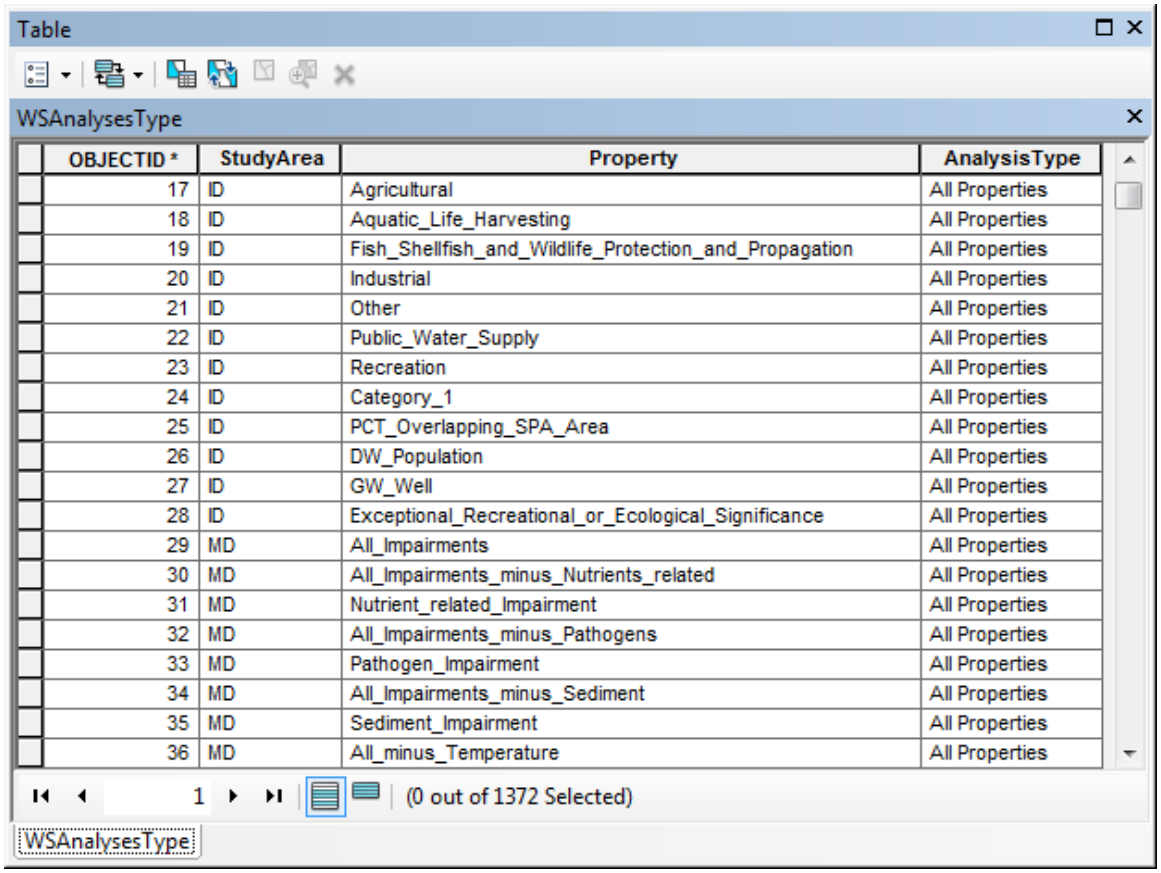


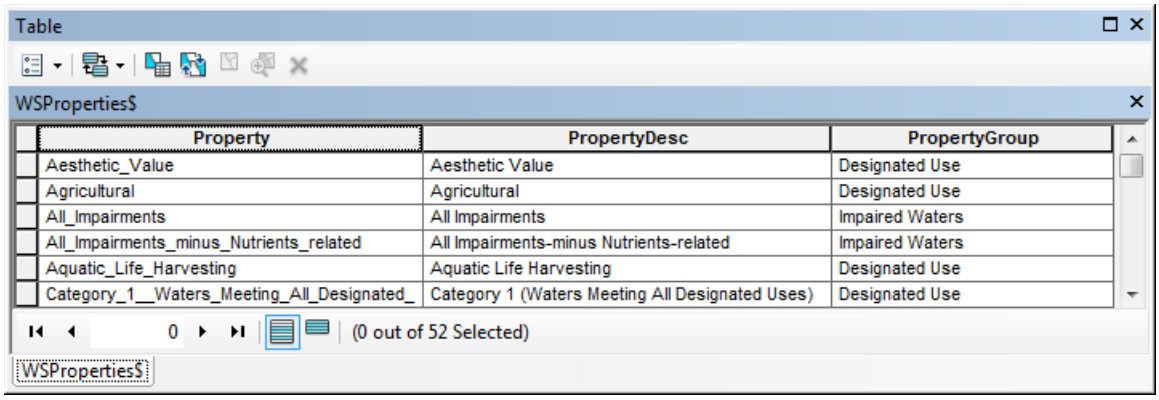
Figure 3-24 – WSAnalysesType Table Uploaded

The custom database is ready to use. You can either start running analyses in your current map or set this new database as your new default EPAWaterscape configuration as described in the next section.

3.4.1 Update Property Group (optional)

If you have left the Property Groups to the default value of None and now wish to update the groups, you may do this in the following way if you have a table defining the link between the properties and their group.

- Add the table defining the groups in ArcMap.



Table

WSProperties$

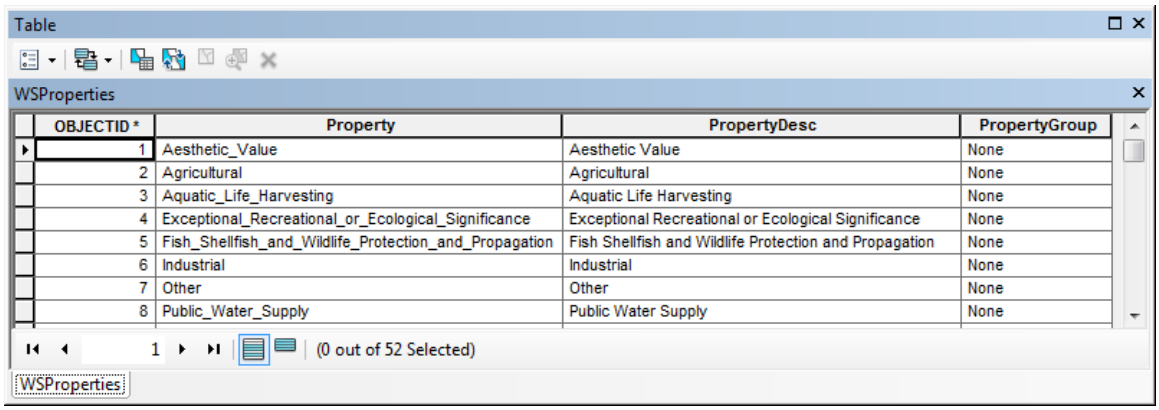
Property	PropertyDesc	PropertyGroup
Aesthetic_Value	Aesthetic Value	Designated Use
Agricultural	Agricultural	Designated Use
All_Impairments	All Impairments	Impaired Waters
All_Impairments_minus_Nutrients_related	All Impairments-minus Nutrients-related	Impaired Waters
Aquatic_Life_Harvesting	Aquatic Life Harvesting	Designated Use
Category_1__Waters_Meeting_All_Designated_	Category 1 (Waters Meeting All Designated Uses)	Designated Use

0 (0 out of 52 Selected)

WSProperties$

Figure 3-25 – Excel Table Defining Link between Group and Property

- Add the newly generated WSProperties table into ArcMap.



Table

WSProperties

OBJECTID *	Property	PropertyDesc	PropertyGroup
1	Aesthetic_Value	Aesthetic Value	None
2	Agricultural	Agricultural	None
3	Aquatic_Life_Harvesting	Aquatic Life Harvesting	None
4	Exceptional_Recreational_or_Ecological_Significance	Exceptional Recreational or Ecological Significance	None
5	Fish_Shellfish_and_Wildlife_Protection_and_Propagation	Fish Shellfish and Wildlife Protection and Propagation	None
6	Industrial	Industrial	None
7	Other	Other	None
8	Public_Water_Supply	Public Water Supply	None

1 (0 out of 52 Selected)

WSProperties

Figure 3-26 – WSProperties table with None Group

- Using the Add Join Field tool, join the WSProperties table with the WSProperties$ table defining the group using the Add Join tool located in the Data Management Tools toolbox within the Joins toolset.

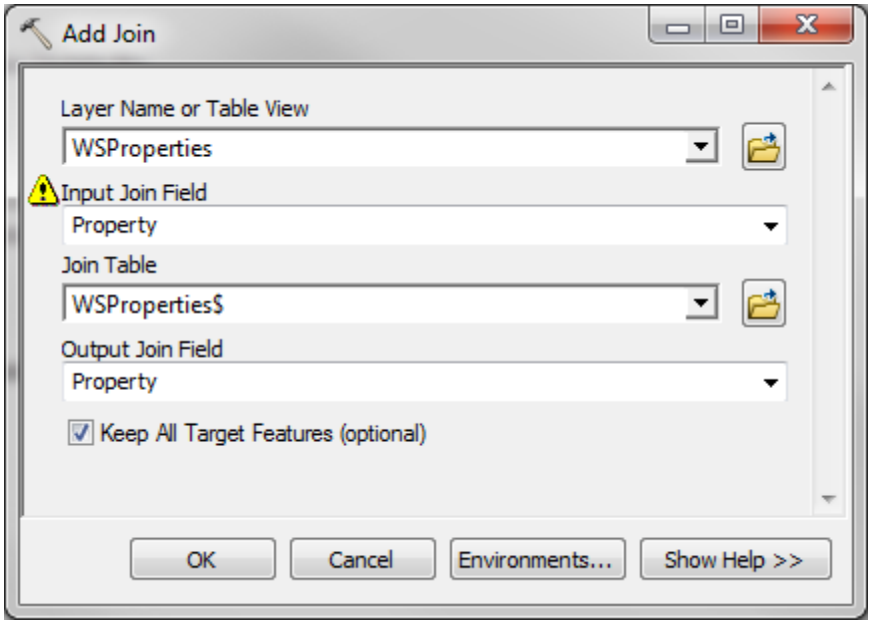


Figure 3-27 – Add Join Tool

- Open the WSProperties table and right-click the first PropertyGroup header (with the None values) and select Field Calculator.

- Set it to the value of the joined PropertyGroup field and click OK.

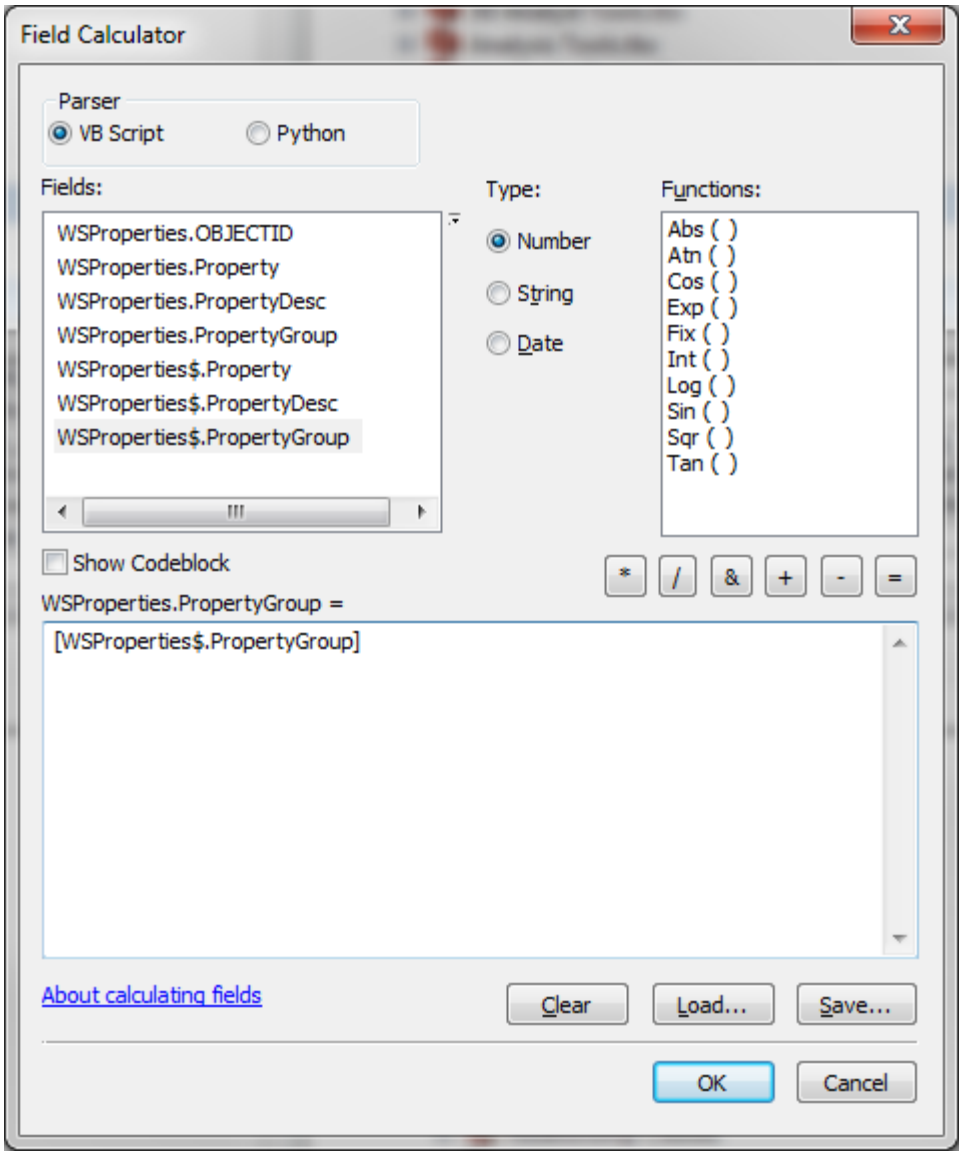


Figure 3-28 – Populating PropertyGroup

- Remove the join by using the Remove Join tool from the Joins toolset.

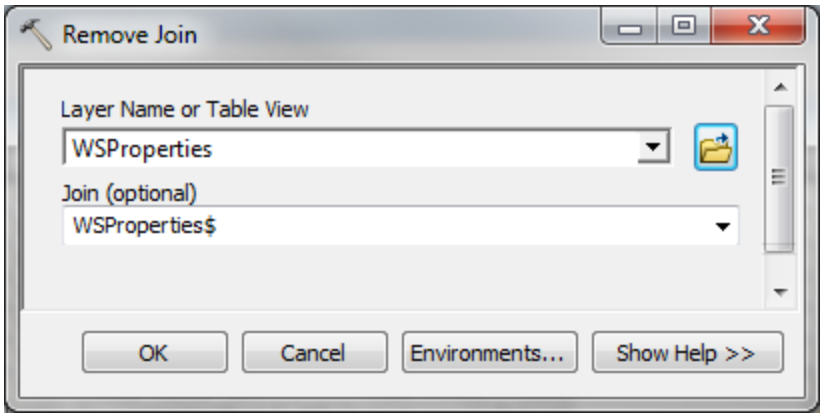
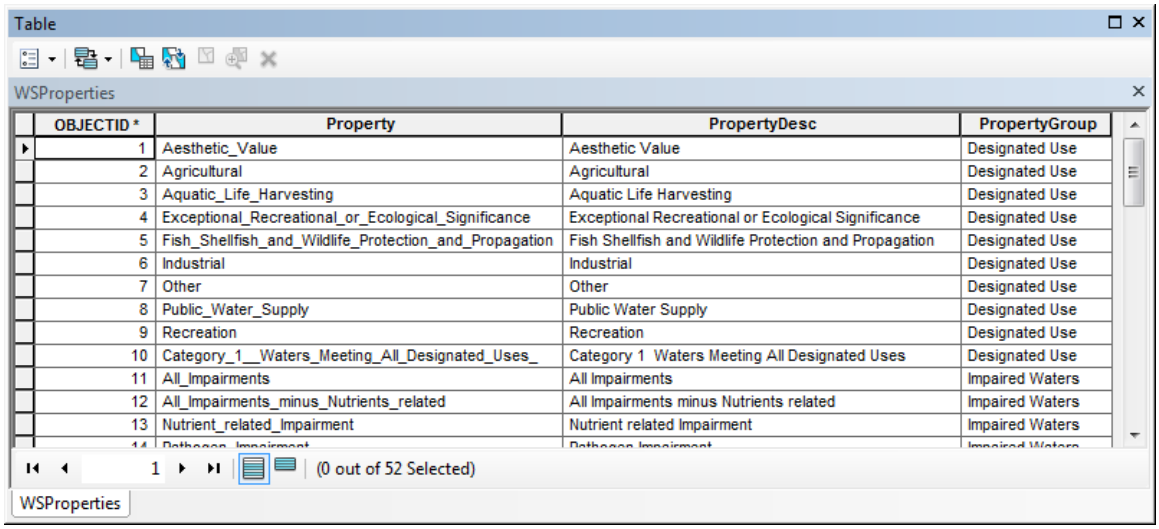


Figure 3-29 – Remove Join Tool

- Close the WSProperties table if it is already open and then open it. The join fields have been removed and the PropertyGroup has been updated.



OBJECTID *	Property	PropertyDesc	PropertyGroup
1	Aesthetic_Value	Aesthetic Value	Designated Use
2	Agricultural	Agricultural	Designated Use
3	Aquatic_Life_Harvesting	Aquatic Life Harvesting	Designated Use
4	Exceptional_Recreational_or_Ecological_Significance	Exceptional Recreational or Ecological Significance	Designated Use
5	Fish_Shellfish_and_Wildlife_Protection_and_Propagation	Fish Shellfish and Wildlife Protection and Propagation	Designated Use
6	Industrial	Industrial	Designated Use
7	Other	Other	Designated Use
8	Public_Water_Supply	Public Water Supply	Designated Use
9	Recreation	Recreation	Designated Use
10	Category_1__Waters_Meeting_All_Designated_Uses_	Category 1 Waters Meeting All Designated Uses	Designated Use
11	All_Impairments	All Impairments	Impaired Waters
12	All_Impairments_minus_Nutrients_related	All Impairments minus Nutrients related	Impaired Waters
13	Nutrient_related_Impairment	Nutrient related Impairment	Impaired Waters

3.5 Set Custom Database as Default EPA Waterscape Administration Database

The default configuration read by the EPAWaterscape tool is stored in the file geodatabase WaterscapeAdmin.gdb located by default under C:\Program Files (x86)\ESRI\EPAWaterscape\Bin. You can replace this database with the one you just created. Before doing so however, you need to copy the following additional administration tables from the original database into your new database:

- WSAnalyses
- WSAnalysisSteps
- WSPropertyAnalysisStep

These tables are originally empty. They will be copied to the target database and populated when an analysis is conducted.

- Copy the tables WSAnalyses, WSAnalysisStep and WSPropertyAnalysisStep from the installed WaterscapeAdmin.gdb file geodatabase into your new database.

- Rename the default database to a different name (e.g. WaterscapeAdmin_installed.gdb).

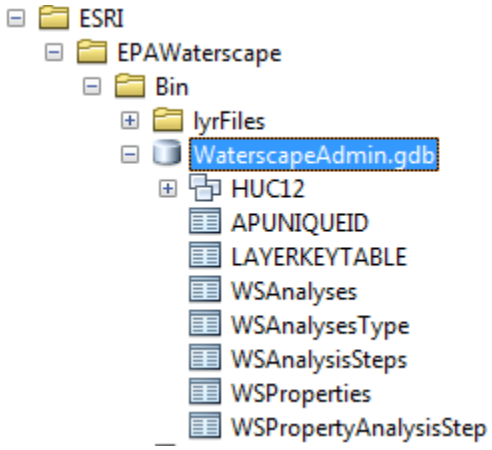


Figure 3-30 – Default WaterscapeAdmin.gdb Database

- Copy your new database in the same location and rename it WaterscapeAdmin.gdb.

4. Configuration

4.1 Symbology

The symbology used by the application is read from layer files stored in the lyrfiles subdirectory.

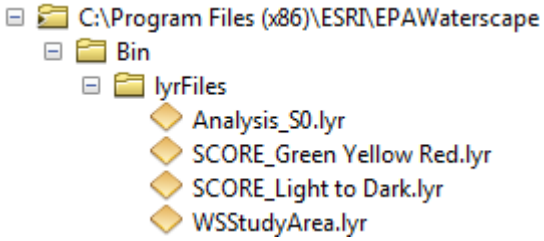


Figure 4-1 – Layer Files

Analysis_S0.lyr is the symbology applied to the initial _S0 layer used to provide a background.
WSStudyArea.lyr is used to symbolize the Study Area. This layer is displayed on top of the others.

The "SCORE_" layer files are displayed in the EPA Waterscape form in the Color Ramp dropdown and are used to render the analysis polygons using the specified Rendering score field.

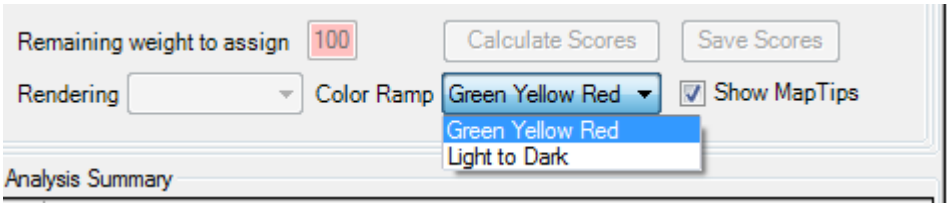


Figure 4-2 – Color Ramp listing available Layer Files

You can add you own custom symbology by saving it as a layer file in the lyrFile folder. The name of the layer file must start with SCORE_ and have the .lyr extension. The new file will be listed in the Color Ramp dropdown the next time the EPAWaterscape button is clicked on the menu bar to open the form.

4.2 Report

The template map document and Word document used to generate the report are stored in the Template subdirectory under the installation location.
The name of the template files and the location of the map template is defined in the configuration XML file EPAWaterscapeConfig installed in the bin folder.

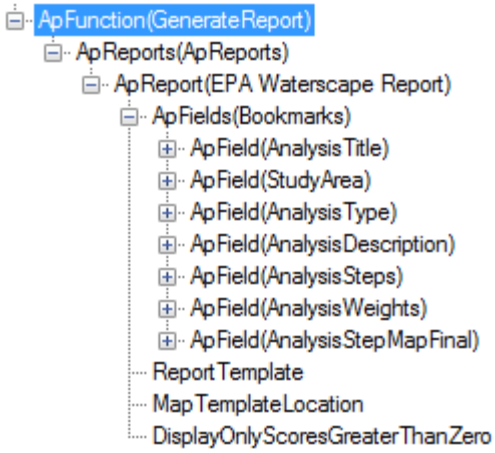


Figure 4-3 – ApFunction(GenerateReport)

The Bookmarks in the XML configuration files are related to bookmarks in the associated Microsoft Word template document. The bookmarks may be displayed in the Word template by selecting the Advanced options and checking the box next to "Show bookmarks".

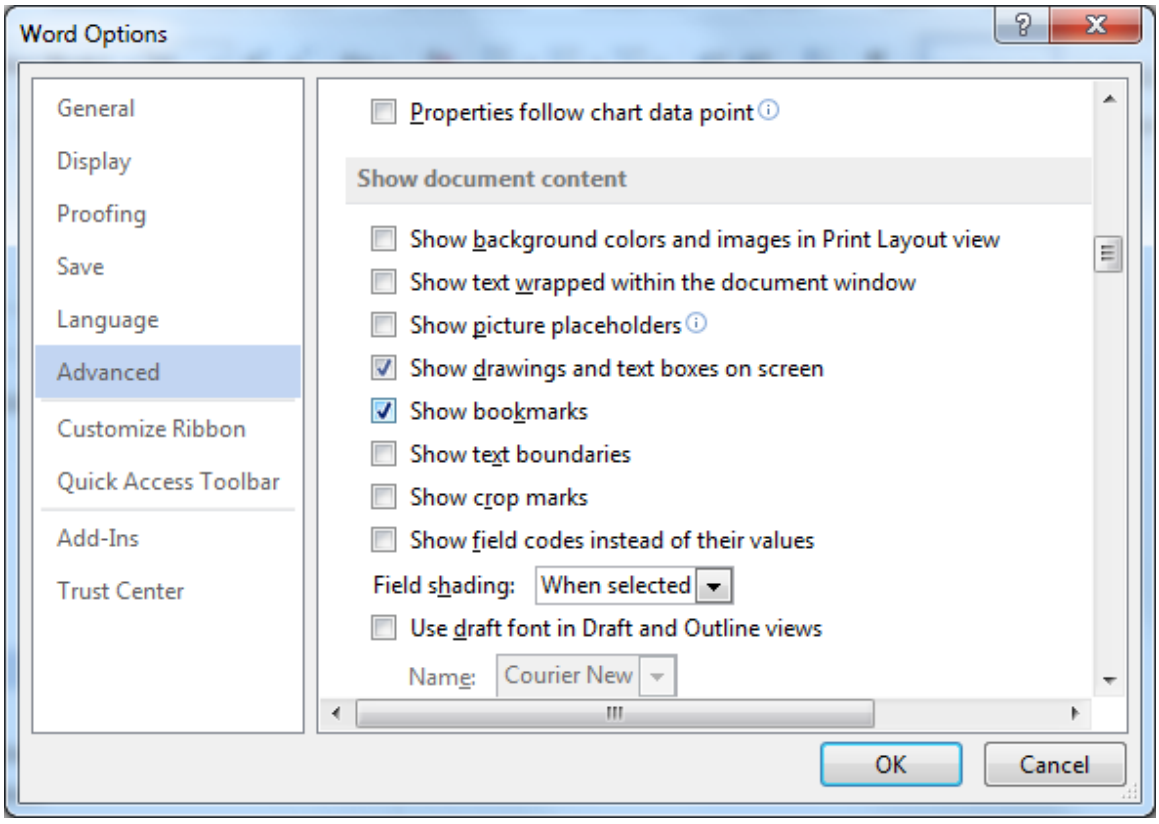
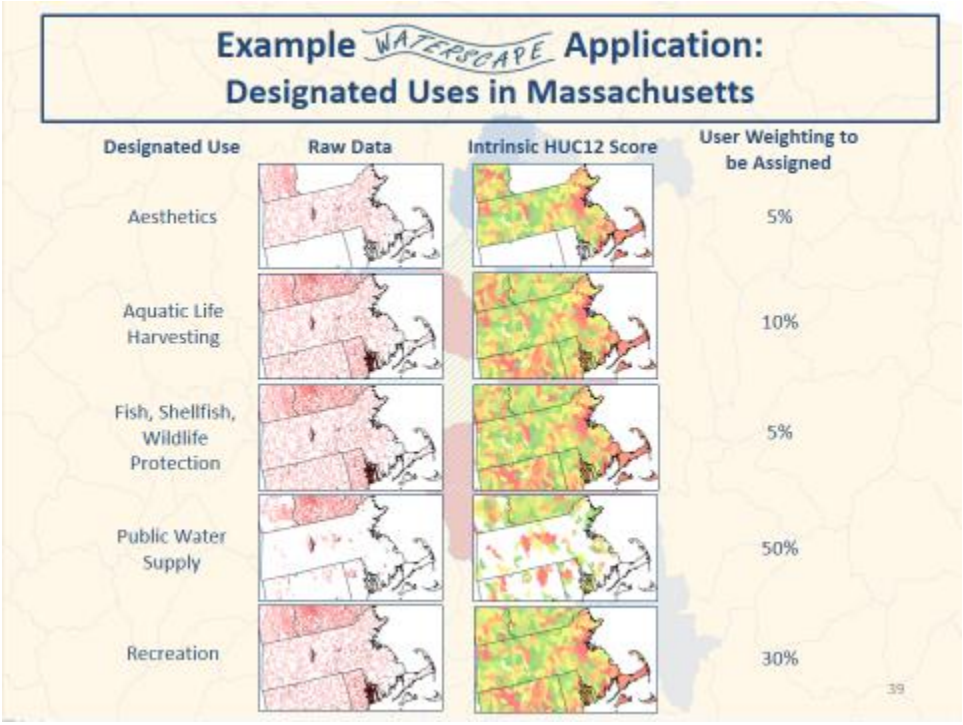


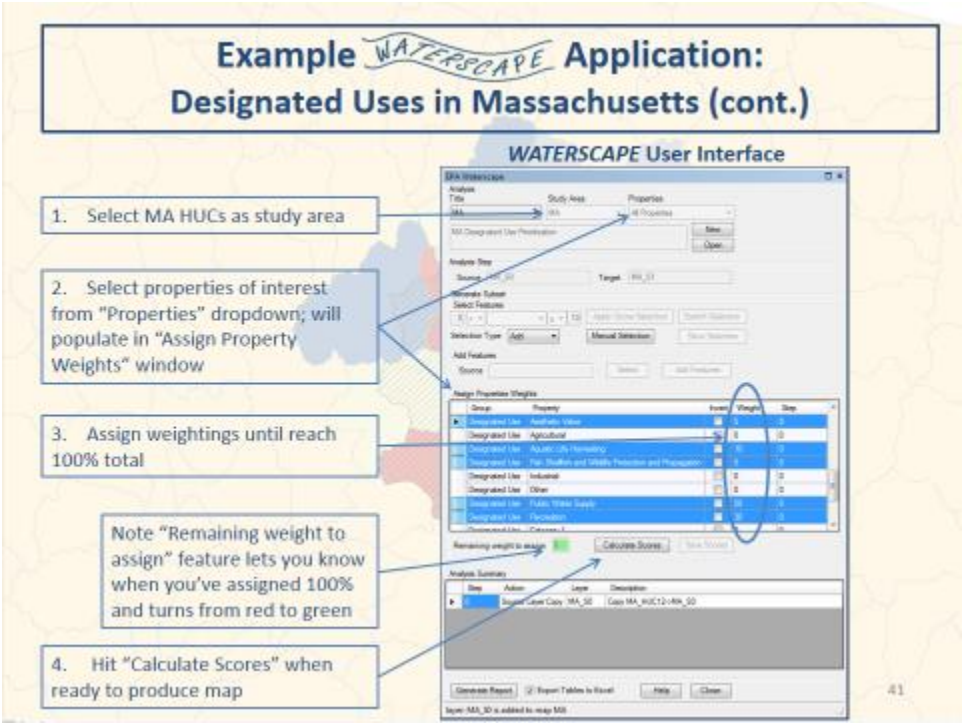
Figure 4-4 – Display Bookmarks in Word Document

5. Analysis Scenario Examples

This section describes hypothetical examples on how the EPA Waterscape application may be used to conduct analyses. The objective of this section is not to provide suggestions or guidelines on how to conduct your own analyses but to demonstrate how the application may support your analytical needs.

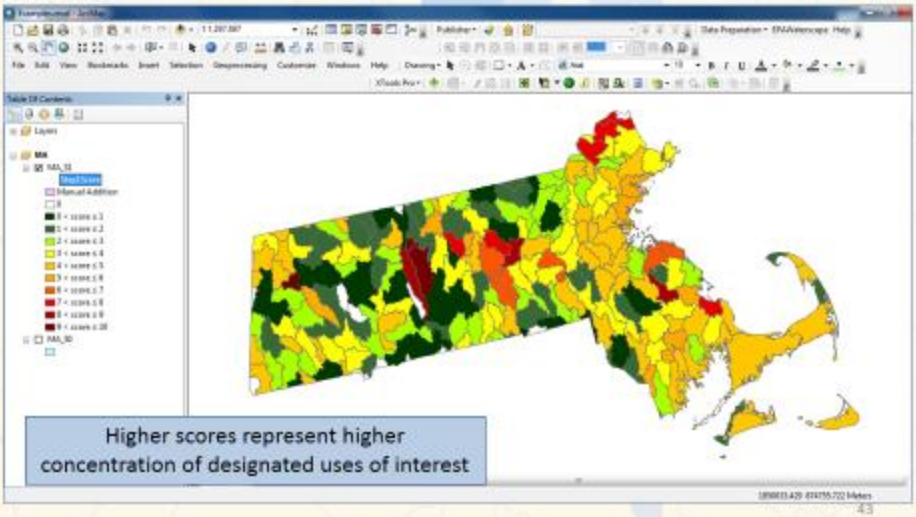
5.1 Massachusetts – Designated Uses





Example WATERSCAPE Application: Designated Uses in Massachusetts (cont.)

Map of MA HUC12s from Designated Use Prioritization Assigned on Previous Slide



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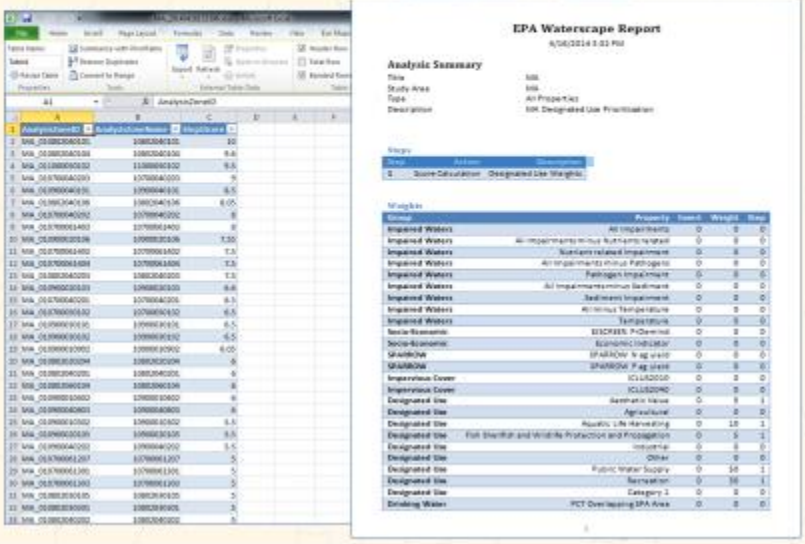
Example WATERSCAPE Application: Designated Uses in Massachusetts (cont.)

In addition to a map, a report can be generated to document steps and resulting HUC12 scores

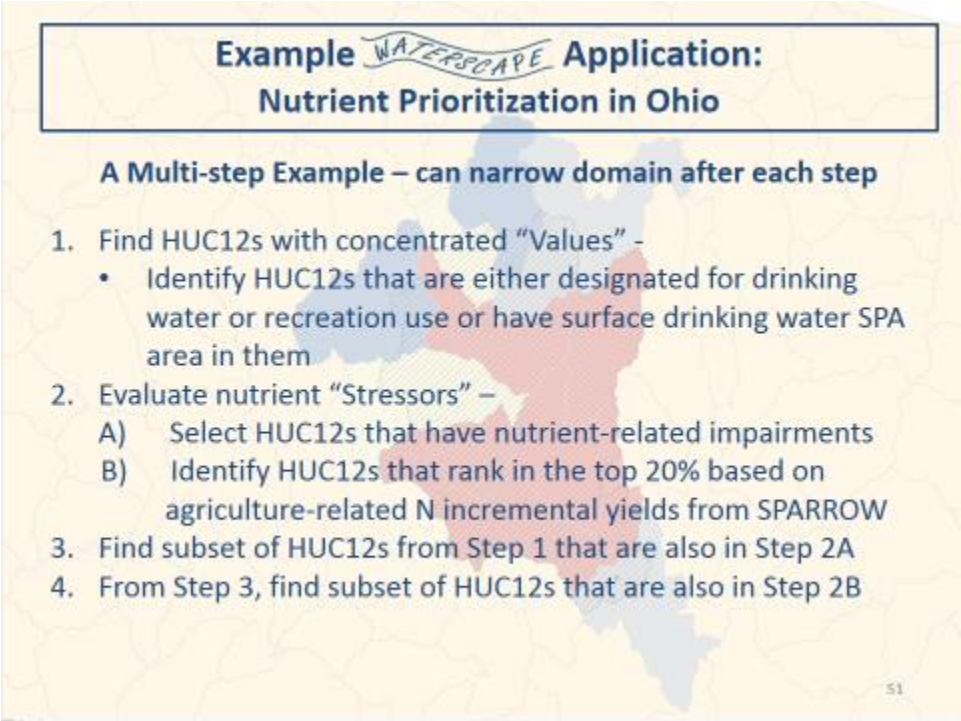


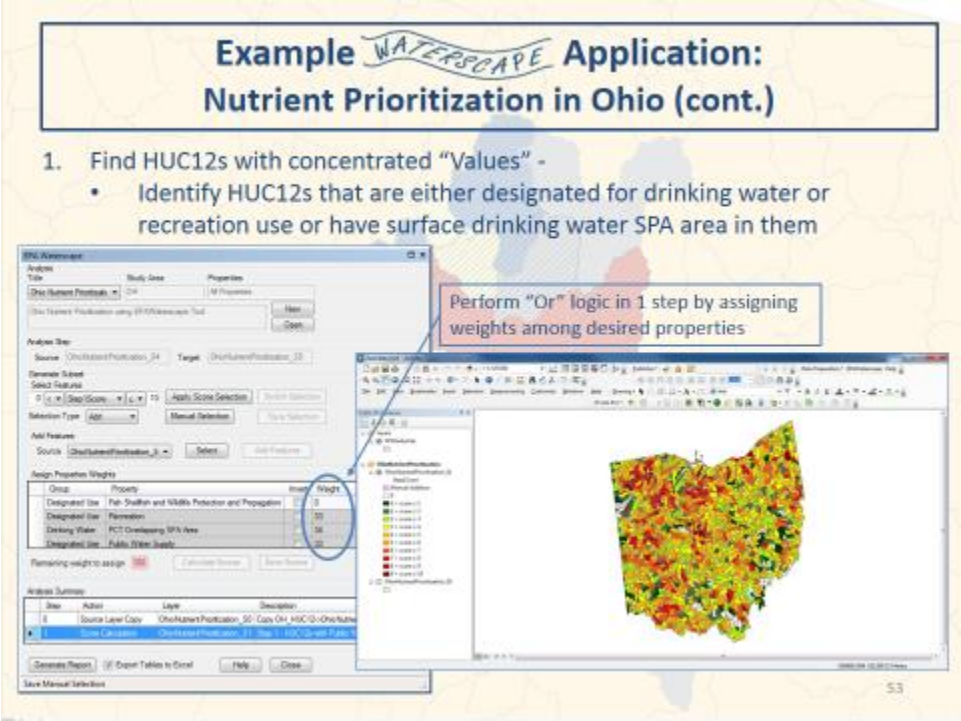
EPA Waterscape Report

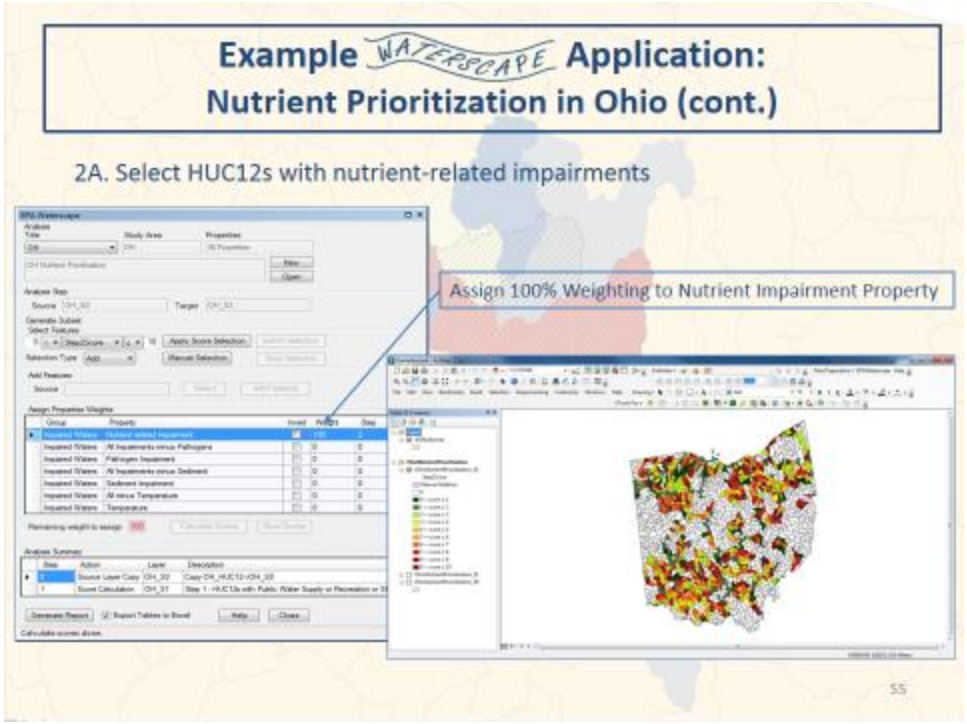
Analysis Summary

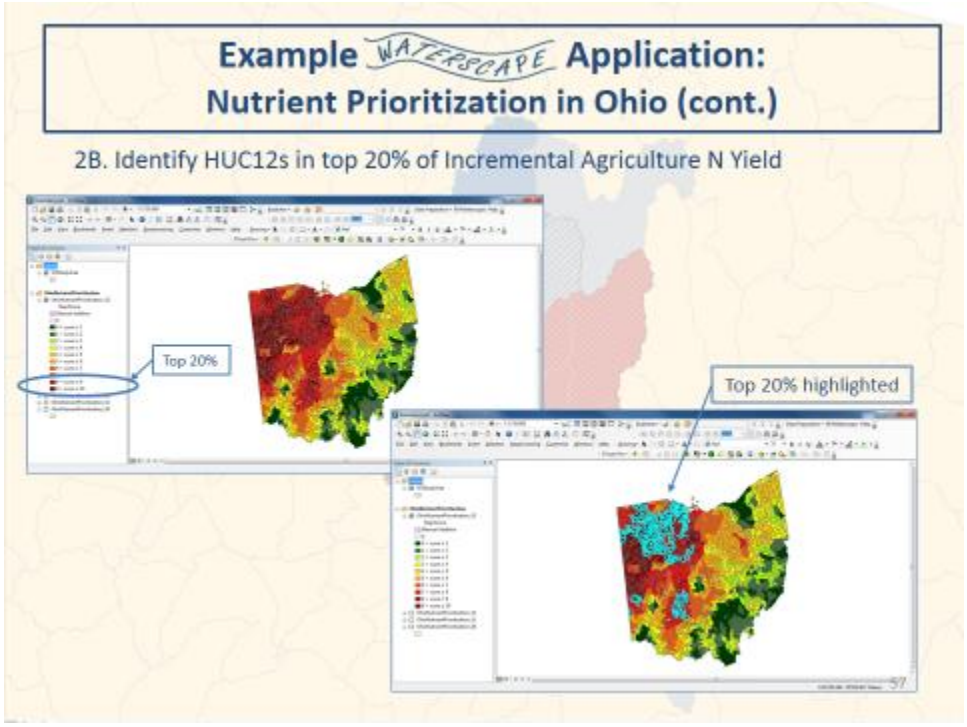
45

5.2 Ohio – Nutrients



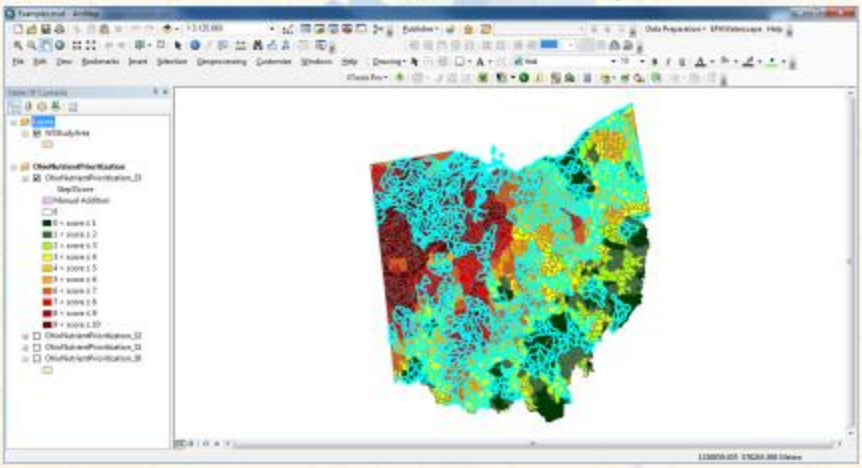



Example WATERSCAPE Application:
Nutrient Prioritization in Ohio (cont.)
2A. Select HUC12s with nutrient-related impairments
Assign 100% Weighting to Nutrient Impairment Property
55


Example WATERSCAPE Application:
Nutrient Prioritization in Ohio (cont.)
2B. Identify HUC12s in top 20% of Incremental Agriculture N Yield
Top 20%
Top 20% highlighted
57

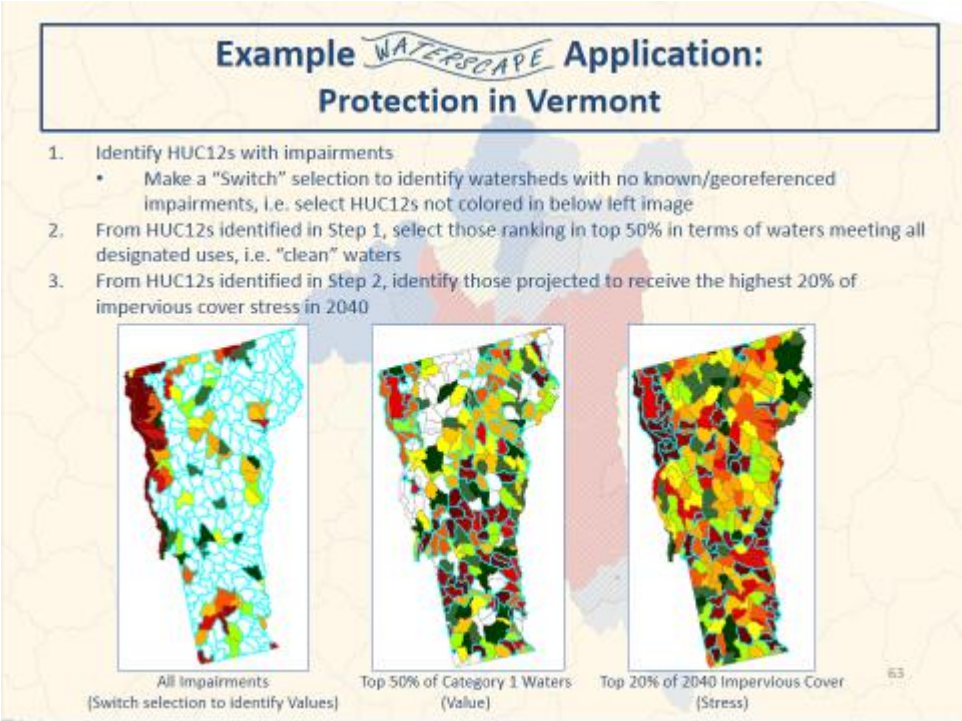
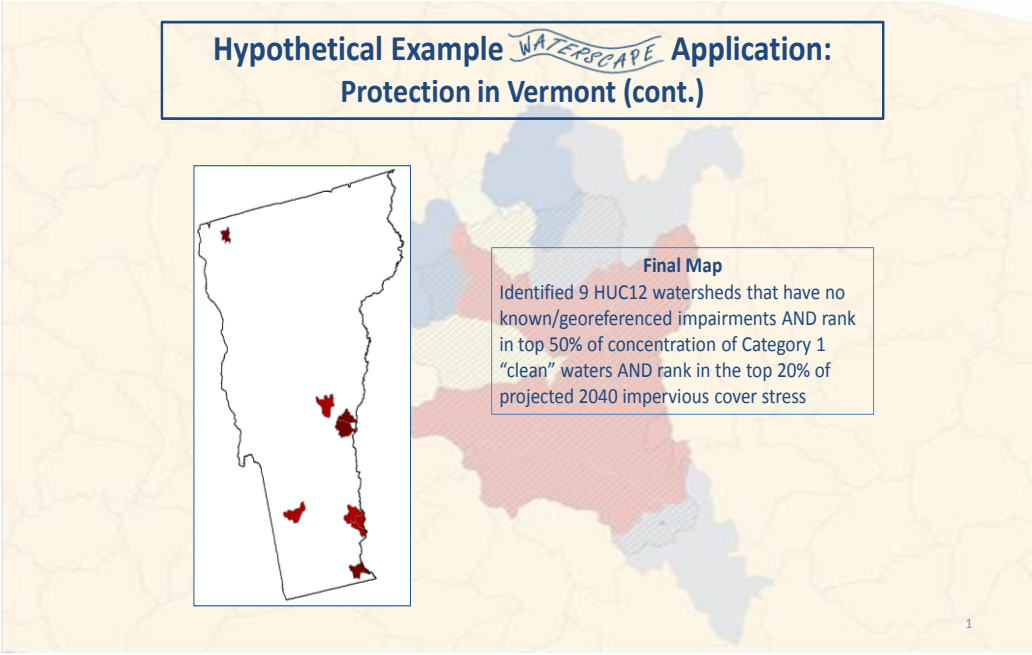
Example WATERSCAPE Application: Nutrient Prioritization in Ohio (cont.)

3. Find subset of HUC12s from Step 1 that are also in Step 2A, i.e., those that have either a drinking water or recreation designated use or have SPA area in them **AND** have nutrient-related impairments



Example WATERSCAPE Application: Nutrient Prioritization in Ohio (cont.)

4. From Step 3, find subset of HUC12s that are also in Step 2B, i.e., those that have either a drinking water or recreation designated use or have SPA area in them and have nutrient-related impairments **AND** rank in the top 20% of agriculture incremental N yield

61

5.3 Vermont – Protection