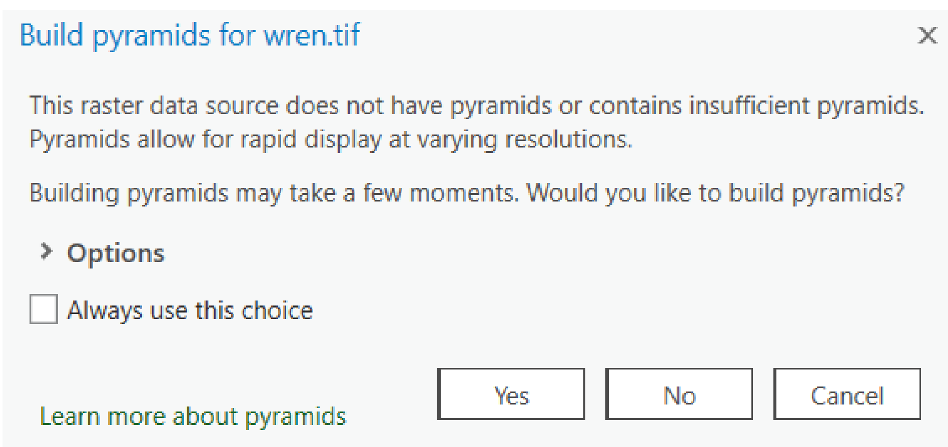
FE257 Lab 5

More work with Overlay and Proximity Operations
Using an Orthophoto to Update a Forest Inventory
Calculating Timber Volumes

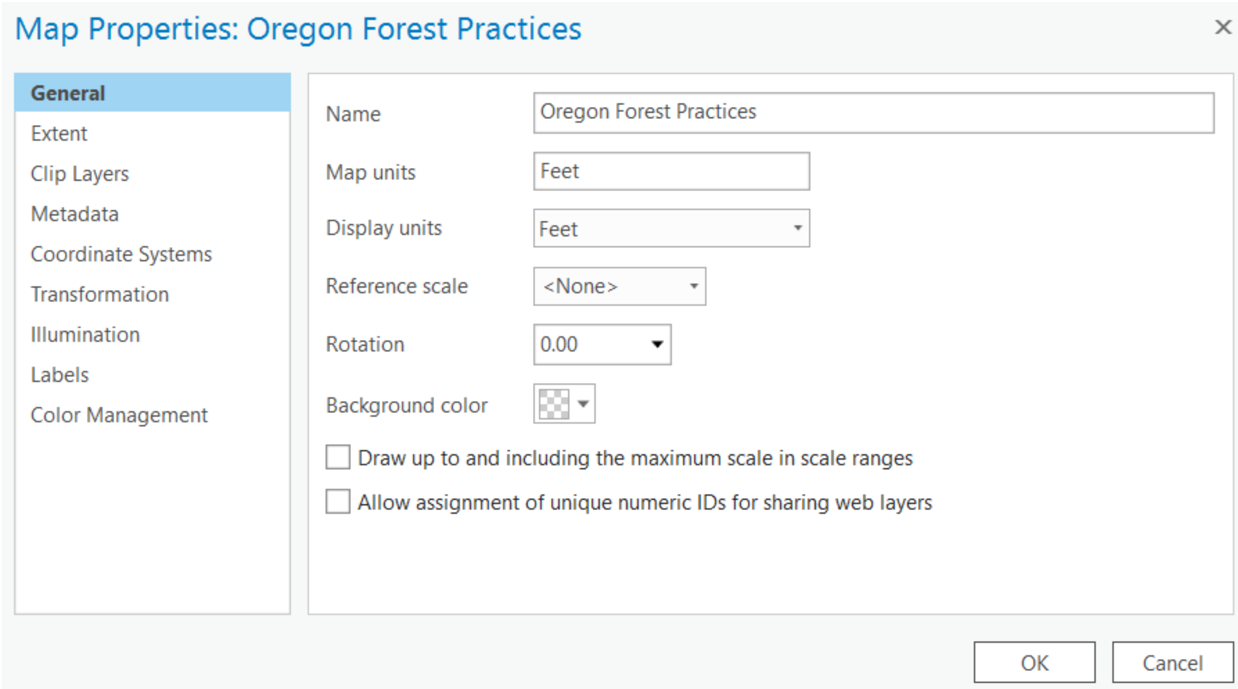
ArcGIS Pro offers a variety of overlay and proximity tools. This lab will ask you to become more familiar with overlay tools in an applied exercise. We'll also use the Catalog module to create and manage spatial data. Our application will be to examine timber values for a harvesting plan in light of the Oregon Forest Practices Act and policy changes that were recommended by the Independent Multidisciplinary Science Team (IMST). Our exercise will involve calculating timber values for lands that are accessible under both frame works. In particular, we will be working with the stream buffer categories and distances recommended by both plans. All data for this exercise are drawn from privately owned timber land located near Wren, Oregon. Values for timber in this area are drawn from pricing information that value Douglas Fir at $500 per thousand board feet (mbf).

Open the Windows Explorer and navigate to the t:\share\classes\fe257\gislab5 location on the forestry network. Using the mouse, right click on this folder and choose Copy from the menu that appears. Use Explorer to navigate to your workspace\fe257 folder. Right click on your workspace folder and choose paste from the menu that appears. This should copy the gislab5 folder and all the files located under it into your workspace.

Open ArcGIS Pro and, as always when starting a project, make a connection to your data folder. Once you establish the connection, open the four files located in your workspace\gislab5 folder into your new map project. One of these files is a raster image of our study area. ArcGIS will prompt you for the creation of pyramids. Select No.



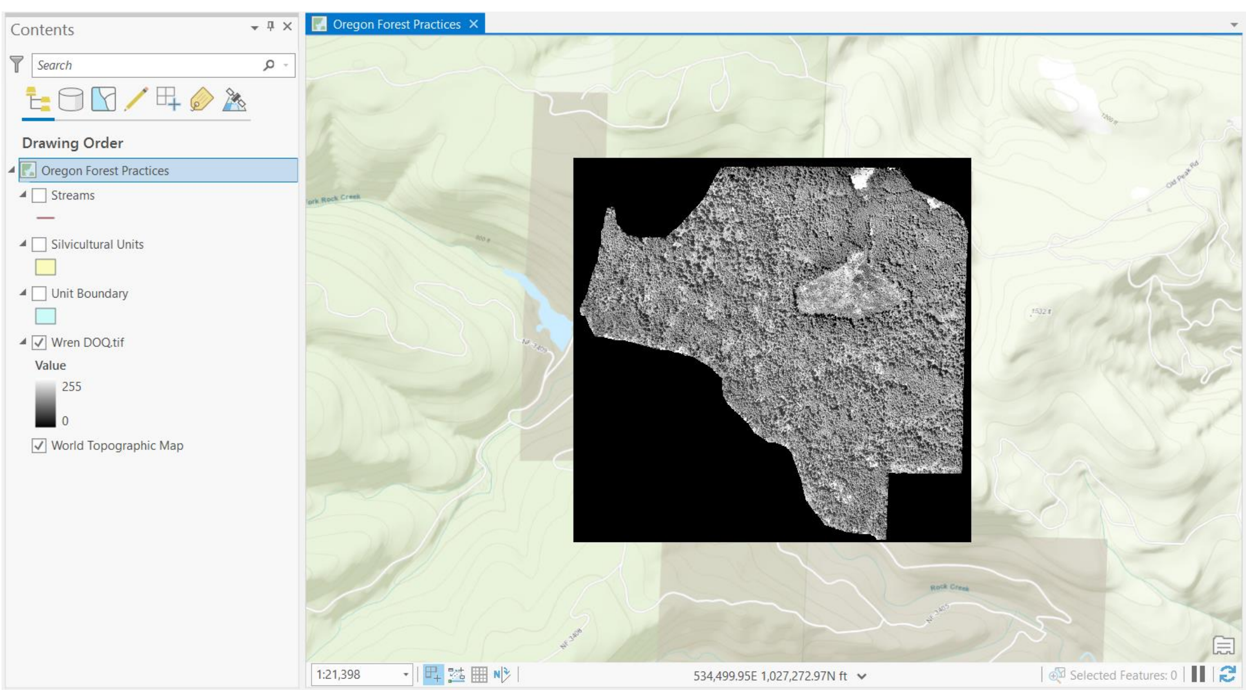
All data for this exercise are stored in the Oregon Centered Lambert Projection that has been adopted by state agencies. The map (coordinate) units are international feet. Let's name our first data frame "Oregon Forest Practices." Save this project as "Lab5.aprx" in your workspace\gislab5 folder.



Your data frame should contain the following shapefiles: unitbndy.shp, streams.shp, silvunit.shp, and wren.tif. Rename these layers to "Unit Boundary," "Streams," "Silvicultural Units," and "Wren DOQ." Make sure that the "Streams" layer is at the top of the Contents. You may want to adjust the symbology to improve your ability to differentiate between the layers. Take a moment to examine each of these layers and their attribute tables.

Viewing a DOQ

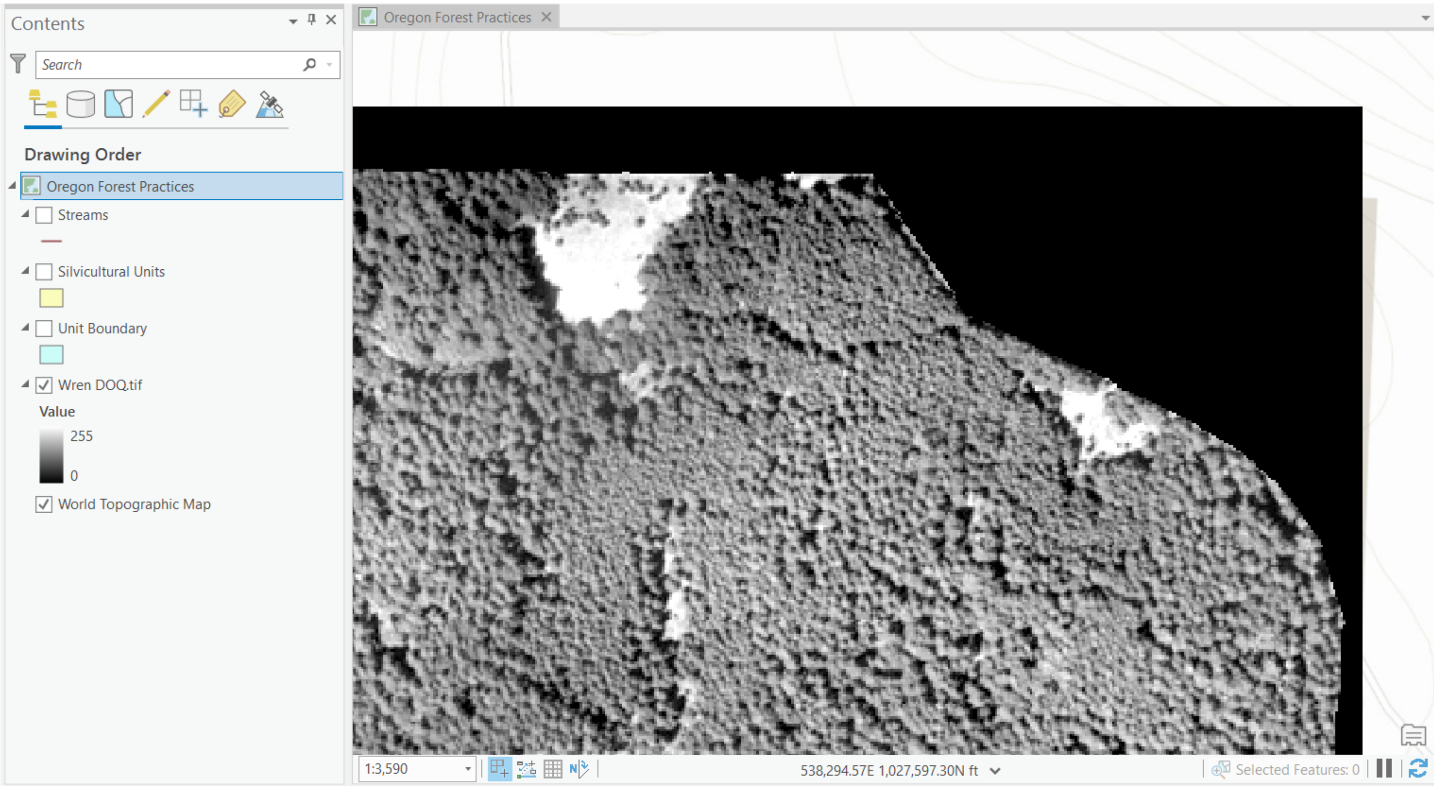
Your layer should include a raster file stored in a TIFF (.tif) format, Wren DOQs. This file is a scanned digital image of a digital orthophoto quadrangle that has been georeferenced. ArcGIS Pro is able to read many graphics formats and will also read any coordinate system that has been stored with the graphic. Your map display area should look similar to the graphic below.



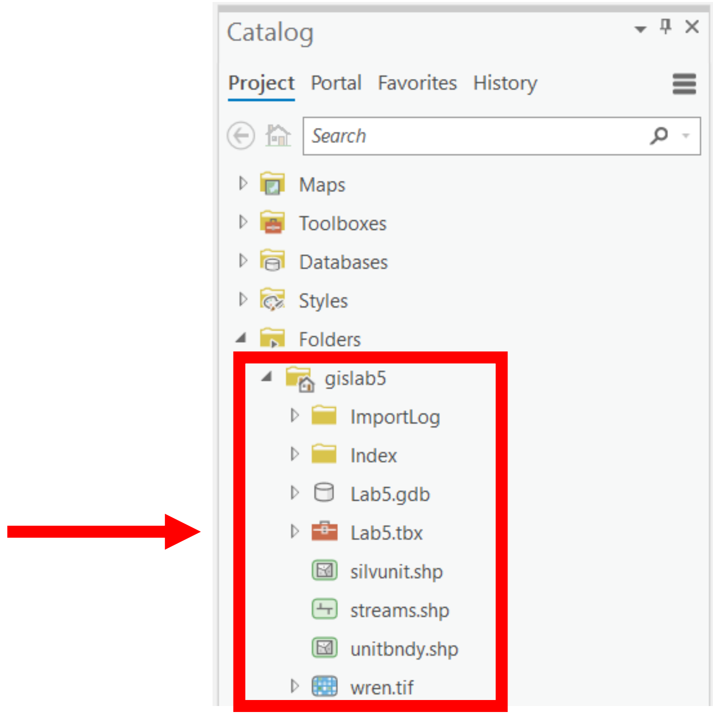
Updating a forest inventory

The field forester has informed us that a small clearing in the northeast corner of our study area needs to be removed from consideration in our calculations. Turn the “Silvicultural Units” and “Unit Boundary” layers off and let’s examine this area on the DOQ.

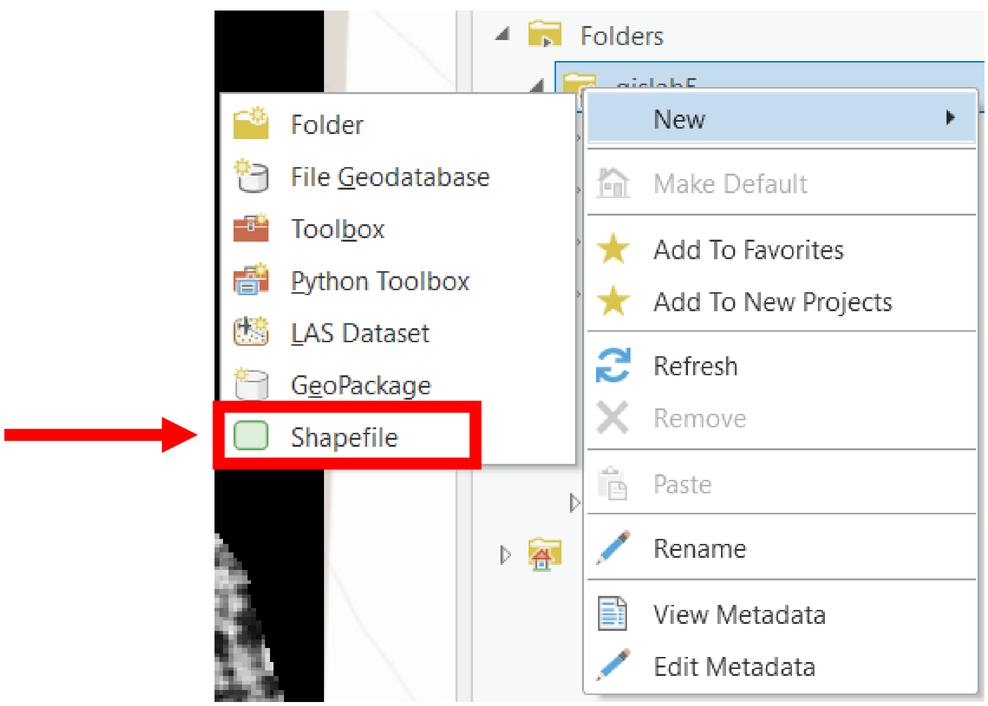
You want to zoom in roughly to the extent shown in the graphic below.



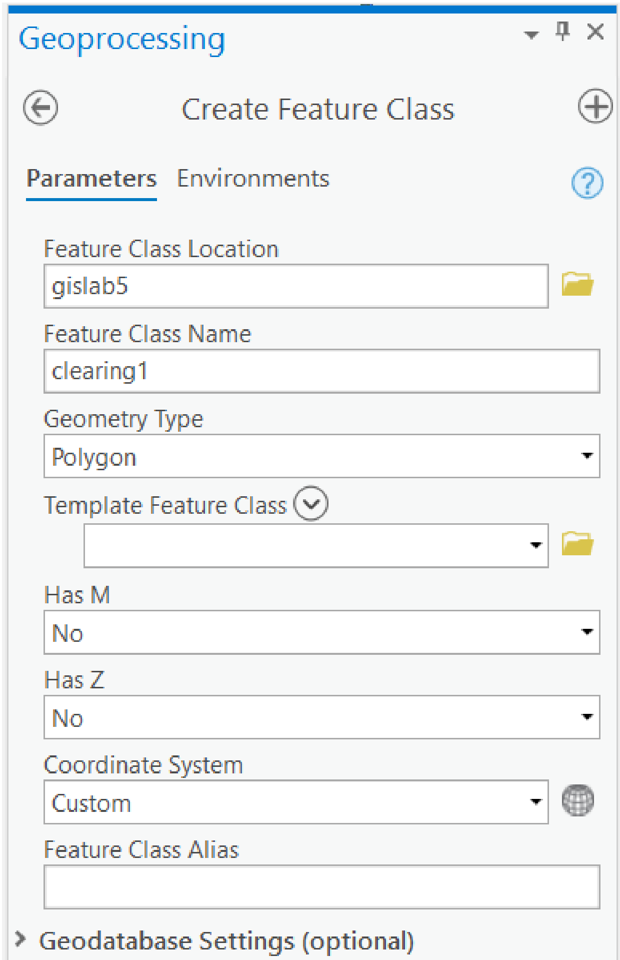
Let’s create a shapefile of this area so we have a file to use for updating the forest inventory information. Creating a shapefile begins by using the Catalog to define the type of shapefile we want (point, line, or polygon) and optionally defining a projection system. Begin the process by switching to the Catalog pane. In Catalog, navigate to the workspace where your data for this lab is stored. You should be able to see all the files in your workspace.



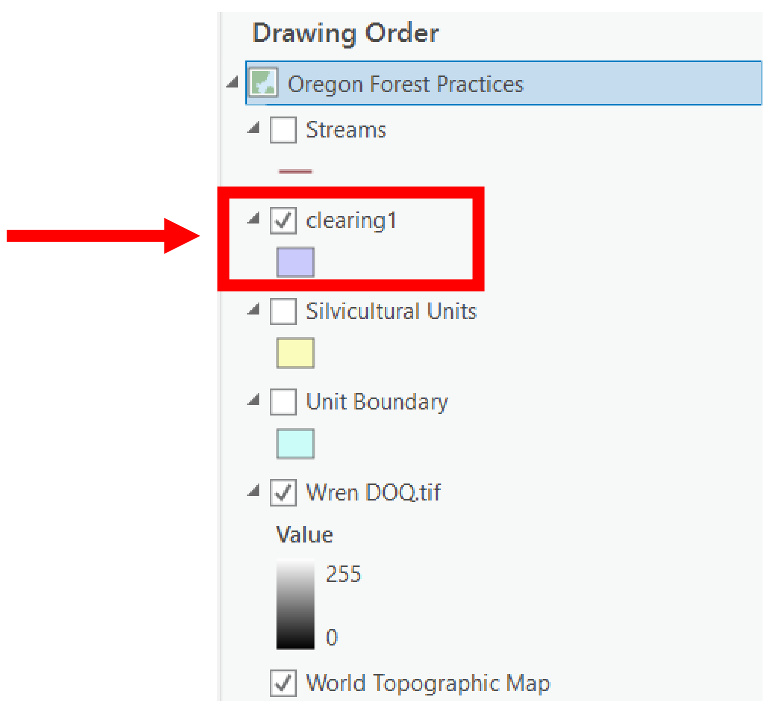
Create a new shapefile by right clicking on the gislab5 folder, selecting New, and picking shapefile from the menu choices.



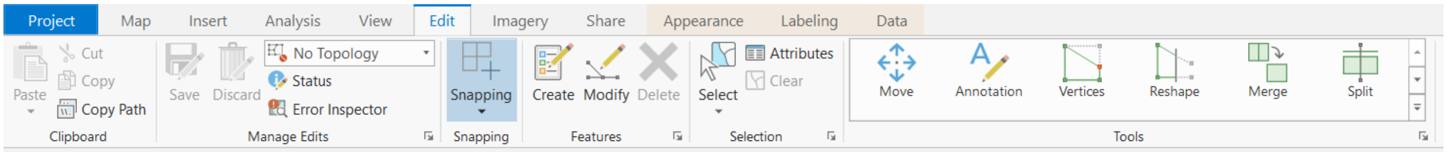
Type “clearing1” in the name box to name the new shapefile. Change the feature type to Polygon. You can associate a projection by using the Coordinate System drop down menu and selecting one of your other layers. All of the shapefiles have projection information defined- the same projection information will be appended to your new shapefile through this method and will read “Custom.” When you’re satisfied with your choice, click the Run button to move forward.



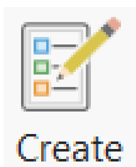
The new shapefile should be added to the Contents.

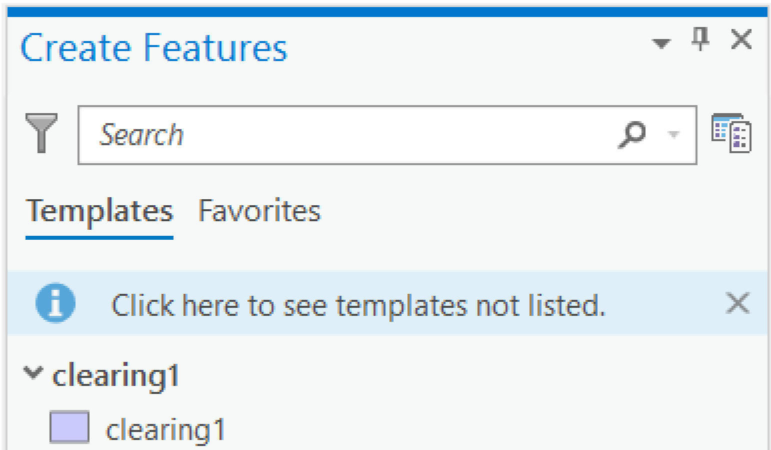


You have now added a new polygon layer to your data frame even though there are no spatial features in the new layer. We can add some polygon features to the new layer by activating the Editor toolbar at the top of the interface.

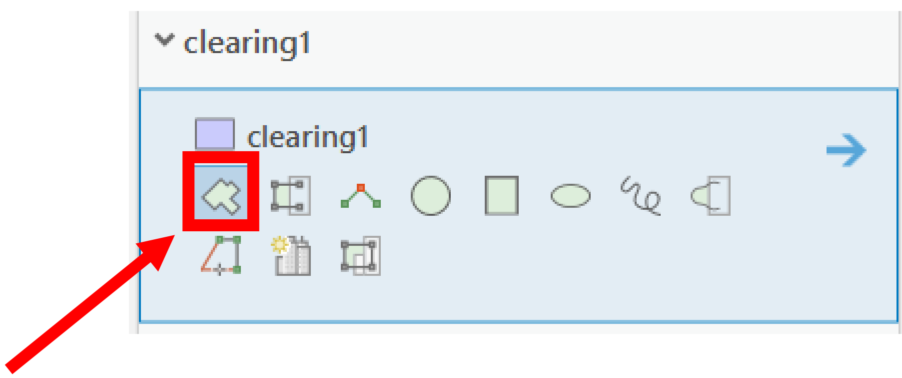


Click the Create icon to begin editing. This will open the Create Features window on the right.



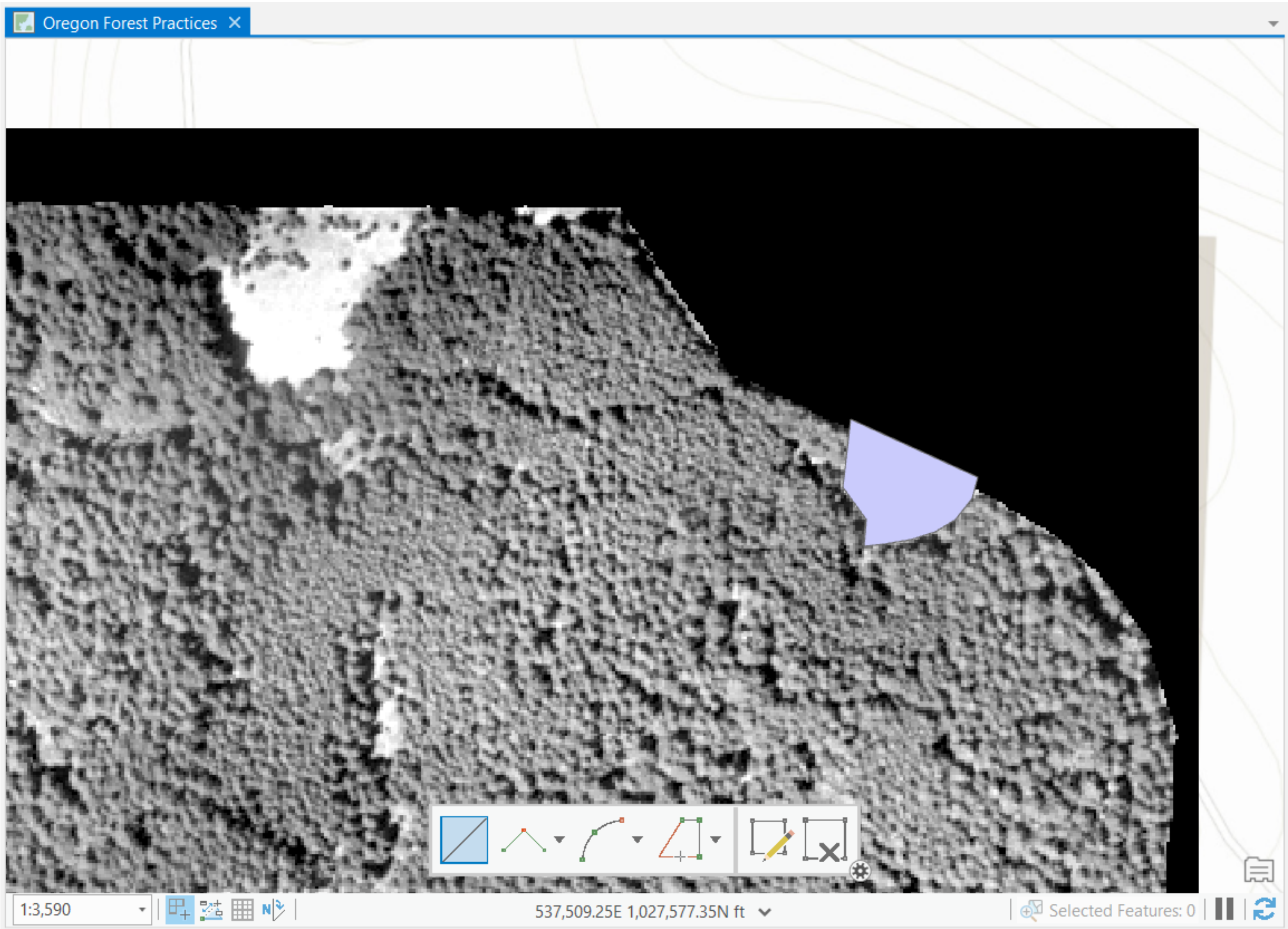


You should see the list of shapefiles that can be edited. You should see “clearing1” in this list. Click once on “clearing1” to show the Construction Tools.

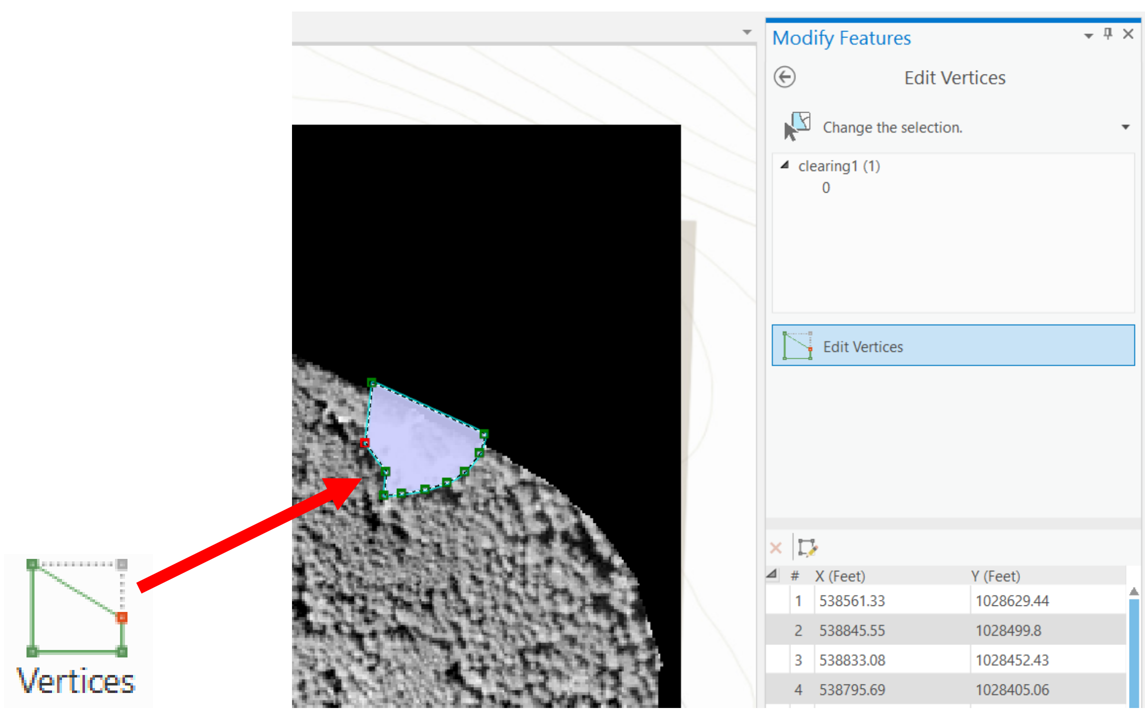


Click on the Polygon icon in the list to activate it. This tool will let us draw a polygon.

Use this tool to trace a polygon around the clearing boundary. Make single clicks with the left mouse button to form each vertex. When you finish creating vertices, double click to end the polygon. Make sure your polygon boundary crosses over the forest boundary on the northeastern portion of the clearing.



If your polygon doesn't look quite right, you can adjust it by using the Vertices edit tool.

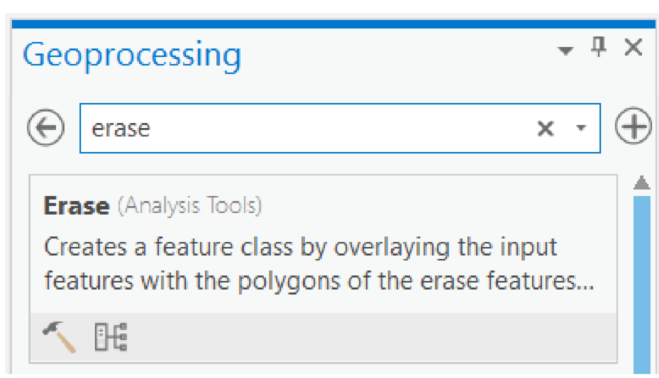


When your polygon looks like the one in the image above, save your edits.

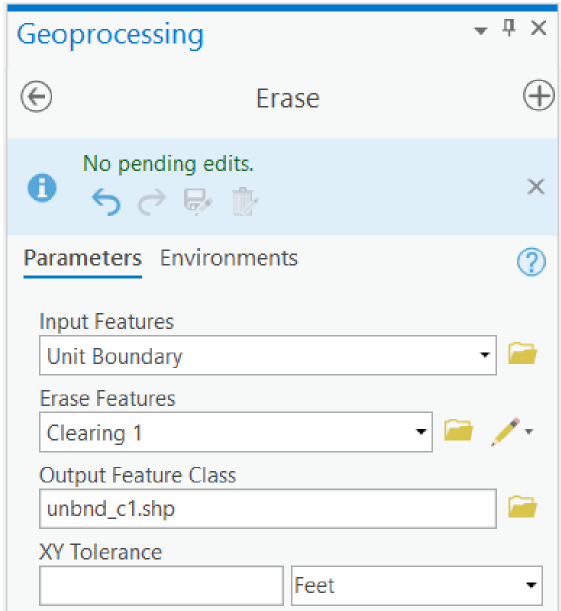
Rename the new layer “Clearing 1.”

Use the new Clearing 1 layer to erase the clearing shape from the “Unit Boundary” layer.

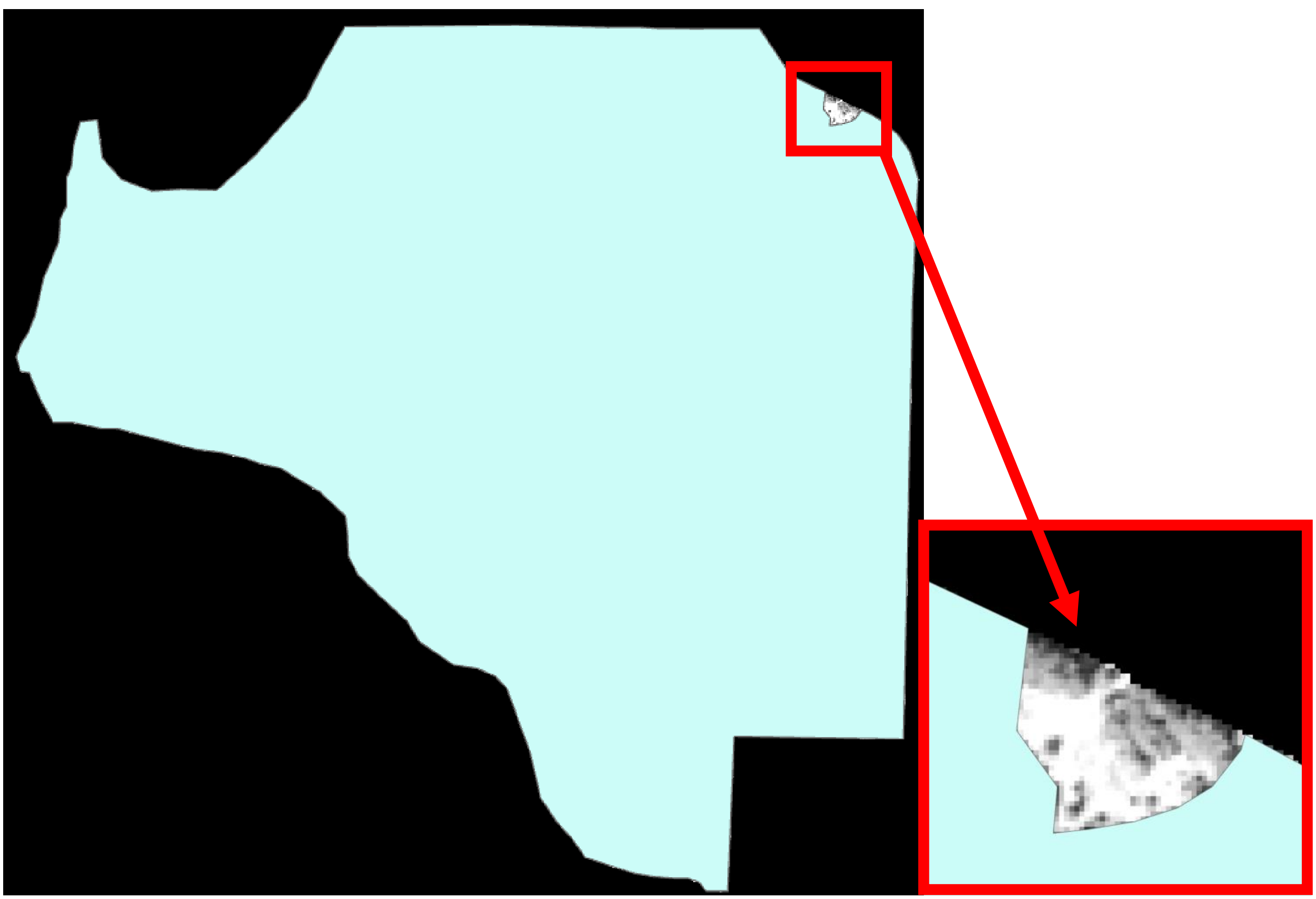
Search for Erase in the Geoprocessing window.



In the dialog box, use the Clearing 1 layer to erase the clearing shape from the Unit Boundary layer. Follow the dialogue box below and make Unit Boundary the Input Features and Clearing 1 the Erase Features. Output the result to your gislab5 folder with the name “unitbnd_c1.shp” (Unit Boundary Clearing 1) and click Run.

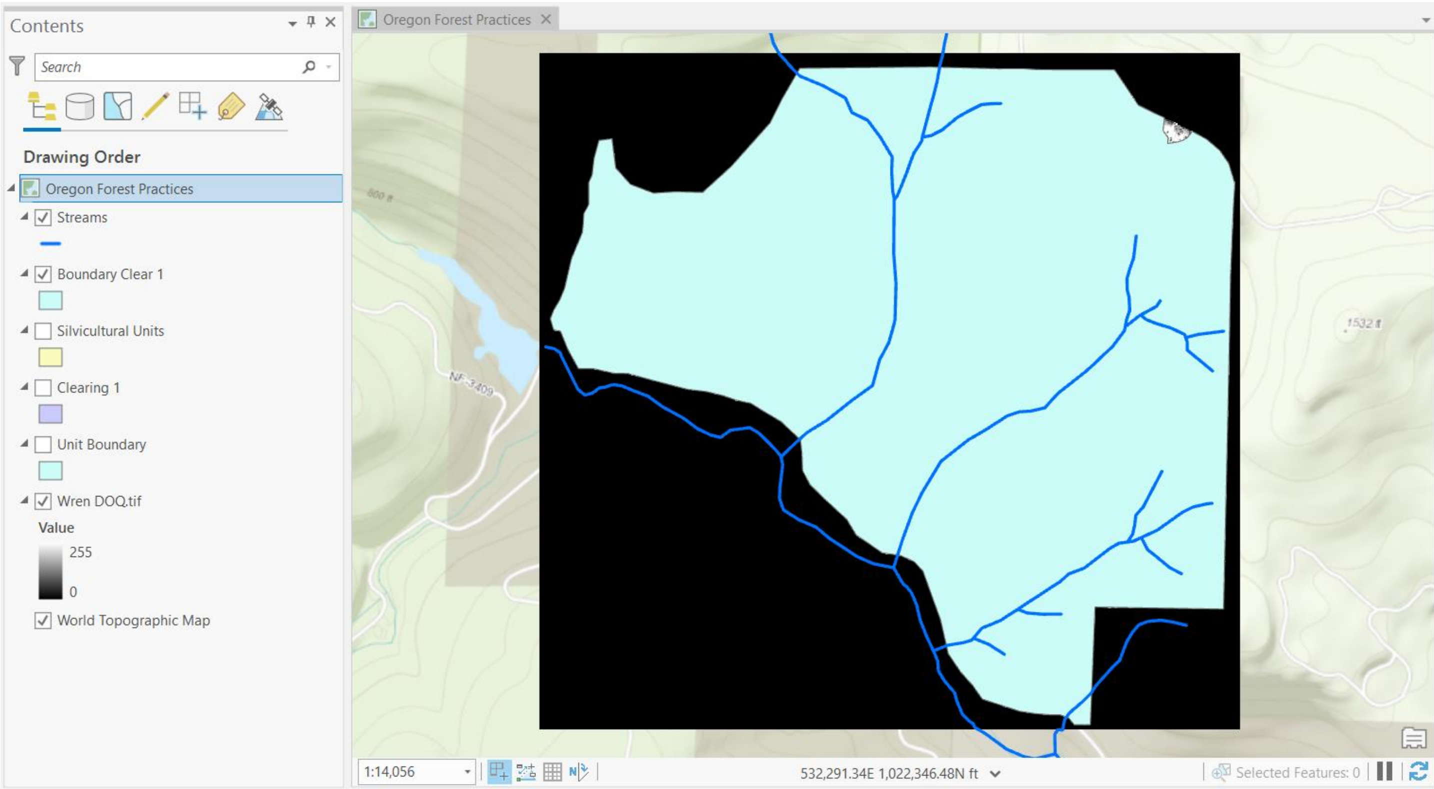


Name the new layer “Boundary Clear 1” and turn off all layers except the new layer and the DOQ to see your results.



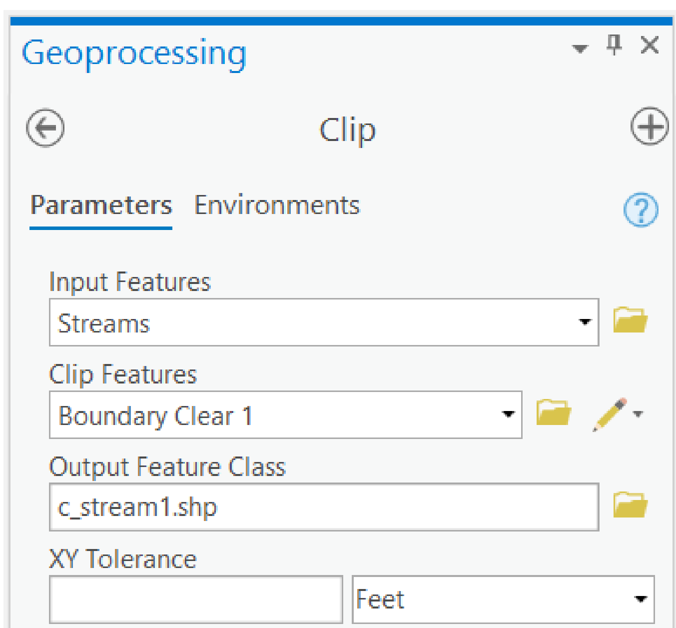
Save your map project and edits.

Right click on the Boundary Clear 1 layer and choose Zoom to Layer to see the extent of the data. Turn the Streams layer on and move it to the top of the Contents window.

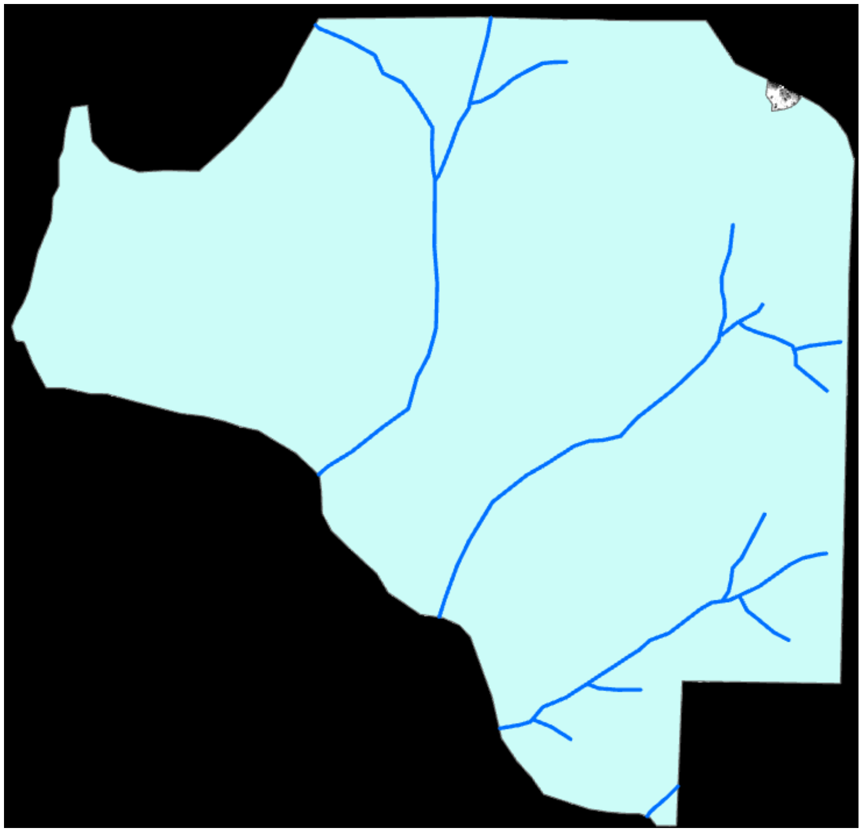


Clipping Streams

Begin the process to create stream buffers by first clipping the Streams layer to our Boundary Clear 1 layer. Search for Clip in the Geoprocessing window and fill out the dialogue box with Streams as the Input Features and Boundary Clear 1 as the Clip Features. Name the output "c_stream1.shp", save it in the gislab5 folder, and click Run.



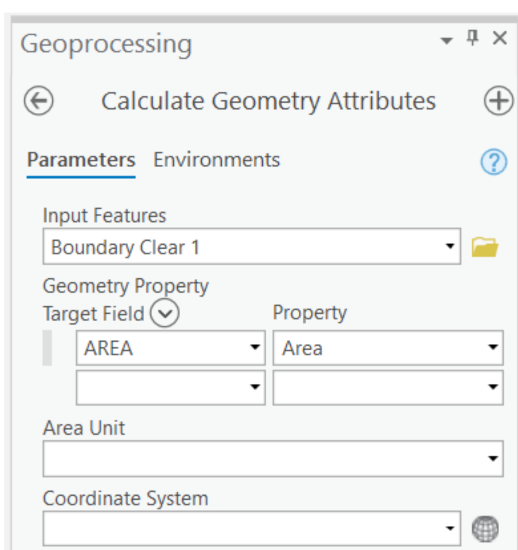
Rename the new layer to "Clipped Streams." Change the layer's symbology to see it more clearly. When finished turn the "Streams" layer off from view.

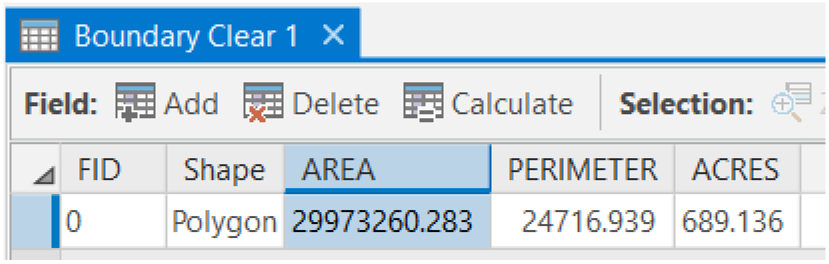


Updating Layer Measurements

Update the measurements of the new Boundary Clear 1 and Clipped Streams layers using Calculate Geometry. **Update layer measurements each time you change the dimensions (size) of a layer.**

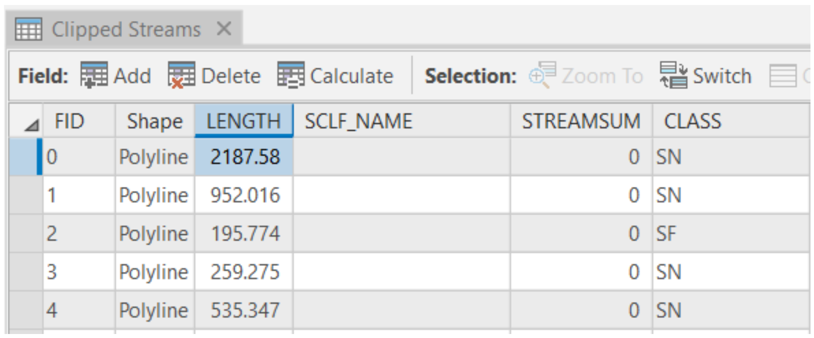
Find the AREA field in the Boundary Clear 1 attribute table. Right click on the field heading and select Calculate Geometry. Make Boundary Clear 1 the Input Features and Change both Target Field and Property to Area. Leave the other fields blank; the program will automatically calculate the data frame units and coordinate system.

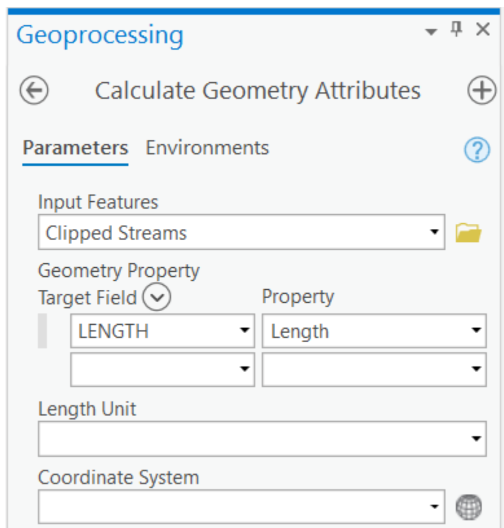




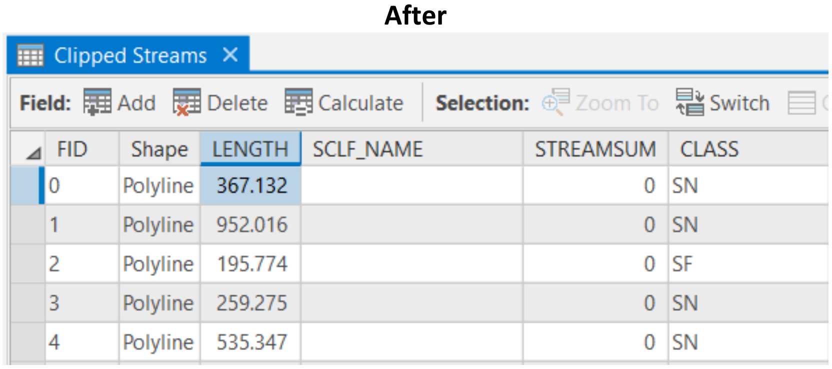
Repeat these steps for the Clipped Streams layer attribute table. Right click on the LENGTH field heading and select Calculate Geometry. This time choose Length for both Target Field and Property.

Before





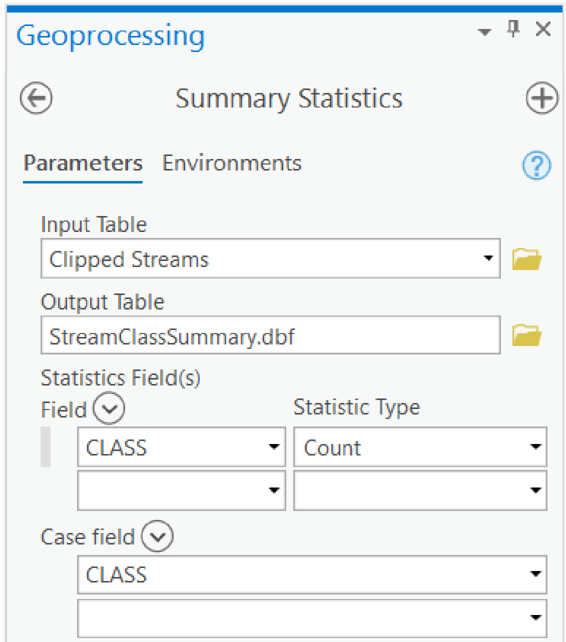
After



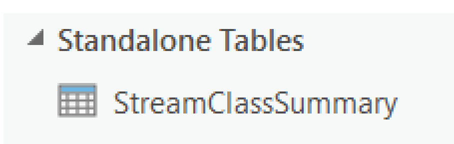
Perform these updates whenever you edit a layer's polygon or line attribute information.

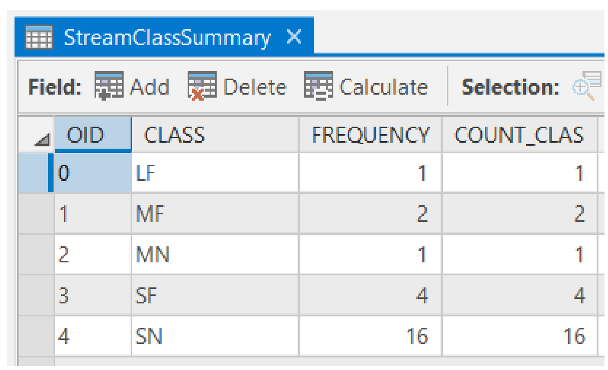
Now that we're up to date, save your map project and edits!

The "Clipped Streams" layer should only contain streams from within Boundary Clear 1. There are only a few fields in the table, the one we're most interested in is "Class." This field contains the stream designations set forth in the Oregon Forest Practices Act. Right click on the "Class" field heading and select Summarize. In the dialogue box, the Input Table is Clipped Streams. Name the Output Table "StreamClassSummary.dbf" and save it to your gislab5 folder. Under Statistics Fields, make the Field CLASS and the Statistic Type Count. Leave CLASS as the Case Field. Click Run.



Open the table when it appears in the Contents. The output table should look like the graphic below.





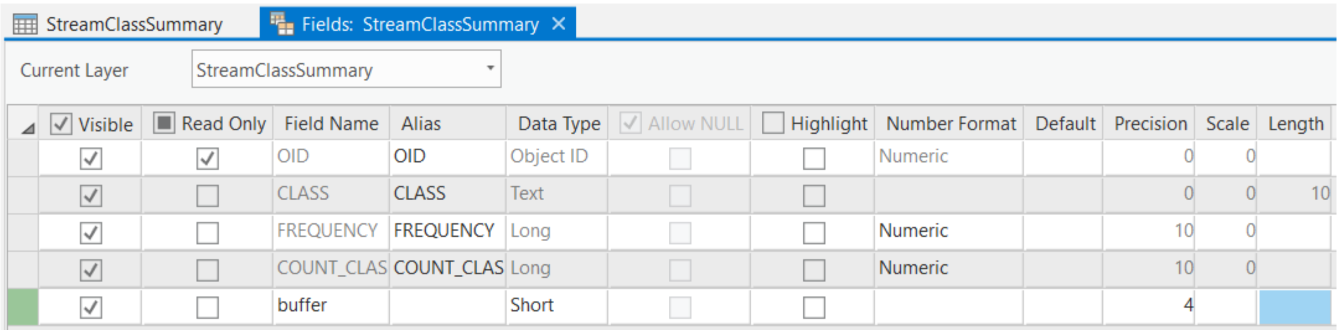
The first letter of the Class field states whether the stream is large (L), medium (M), or small (S). The second letter tells us whether the stream is fish bearing (F) or non-fish bearing (N). The majority of streams in the study area are small, non-fish bearing. **Table 1** lists the stream buffer widths used as riparian management areas (RMAs) in western Oregon. Use the information in the table below to create stream buffers in the next steps.

Table 1. Oregon Forest Practices Act: Riparian Management Area Buffers.

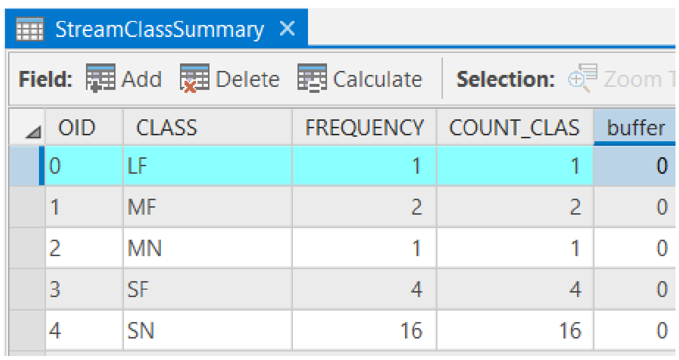
	Type F	Type N
Size	Fish Bearing	Non-Fish
Large	100 feet	70 feet
Medium	70 feet	50 feet
Small	50 feet	0 feet

Add a buffer variable to the StreamClassSummary table and join the file with the Clipped Streams attribute table.

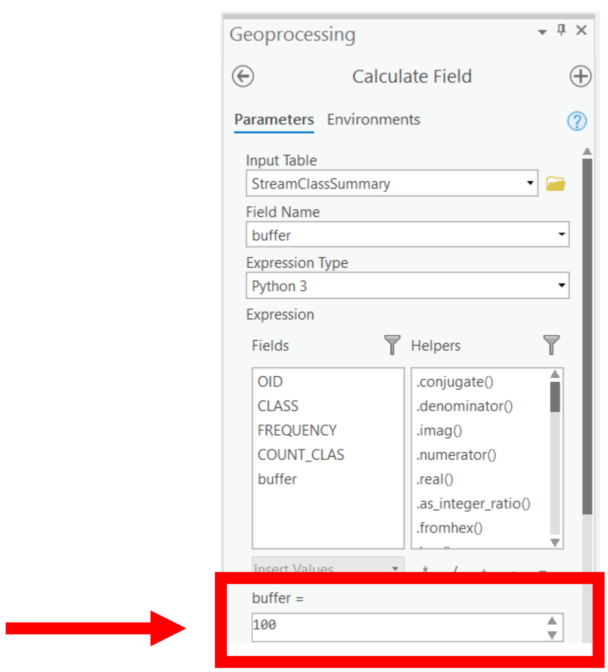
1. In the StreamClassSummary table, Click Add in the Fields toolbar.
2. Enter buffer in the Field Name box, Short Data Type, and Precision 4. Click Save in the Standalone Table toolbar at the top of the Interface.



You should see the new buffer field in the StreamClassSummary table. Select the first row by clicking in the left-most cell; the entire row should be highlighted.



Right click on the buffer field heading and select Calculate Field. In Table 1, LF stands for large, fish bearing streams and receives a 100-foot buffer. Type 100 into the input box and click Run.



OID	CLASS	FREQUENCY	COUNT_CLAS	buffer
0	LF	1	1	100

Repeat this process for the other values in the Class field. Your final table should look like the graphic below. If your table doesn't match the graphic below, make corrections.

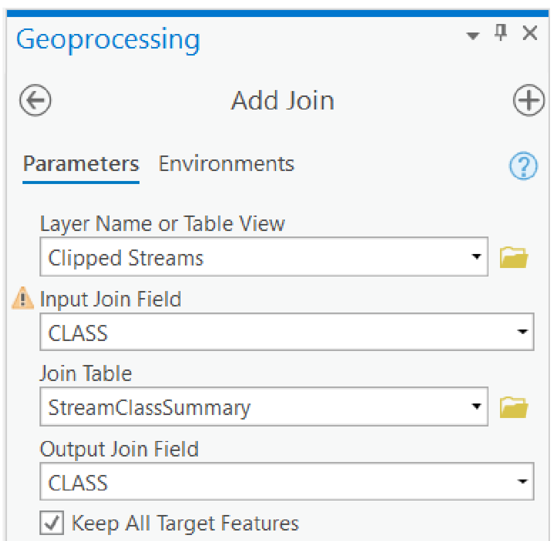
StreamClassSummary

Field: Add Delete Calculate Selection: Zoom To

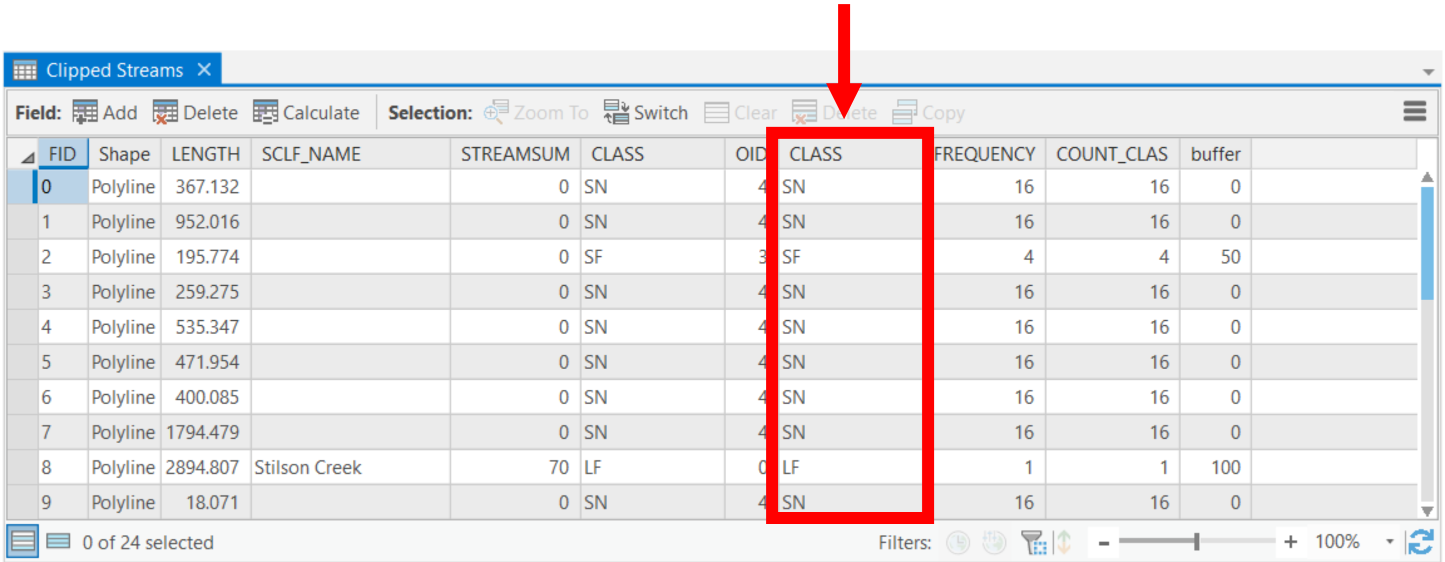
OID	CLASS	FREQUENCY	COUNT_CLAS	buffer
0	LF	1	1	100
1	MF	2	2	70
2	MN	1	1	50
3	SF	4	4	50
4	SN	16	16	0

Join the StreamClassSummary buffer table to the Clipped Streams layer attributes. The joined data should give us a buffer value for every stream. Go to the Contents and locate the Clipped Streams layer. Right click on this layer, chose Joins and Relates, then Add Join.

In the dialogue box, make the Input Join Field CLASS (ignore the index warning), the Join Table StreamClassSummary, and the Output Join Field CLASS. Click Run.



Close the StreamClassSummary table. Open the Clipped Streams attribute table and scroll to the end. Notice the variables from the StreamClassSummary table were added to the Clipped Streams table and all streams now have a buffer. The tables were joined in a "one to many" relationship with the CLASS field as the join item. Notice the CLASS field is retained twice. **Hide or delete the second CLASS field, the one associated with the StreamClassSummary table.**



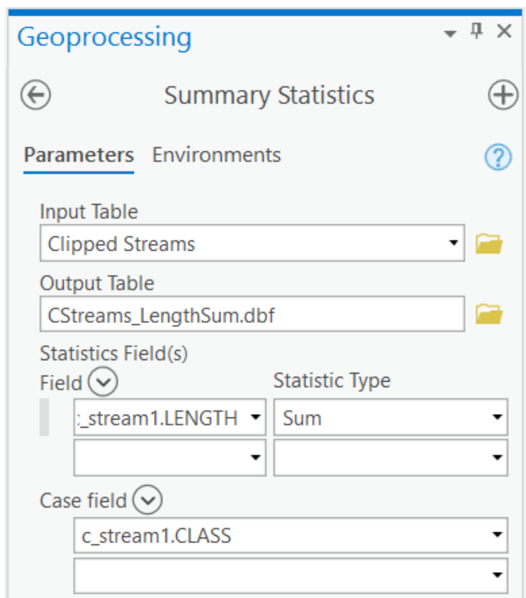
Clipped Streams

FID	Shape	LENGTH	SCLF_NAME	STREAMSUM	CLASS	OID	CLASS	FREQUENCY	COUNT_CLAS	buffer
0	Polyline	367.132		0	SN	4	SN	16	16	0
1	Polyline	952.016		0	SN	4	SN	16	16	0
2	Polyline	195.774		0	SF	3	SF	4	4	50
3	Polyline	259.275		0	SN	4	SN	16	16	0
4	Polyline	535.347		0	SN	4	SN	16	16	0
5	Polyline	471.954		0	SN	4	SN	16	16	0
6	Polyline	400.085		0	SN	4	SN	16	16	0
7	Polyline	1794.479		0	SN	4	SN	16	16	0
8	Polyline	2894.807	Stilson Creek	70	LF	0	LF	1	1	100
9	Polyline	18.071		0	SN	4	SN	16	16	0

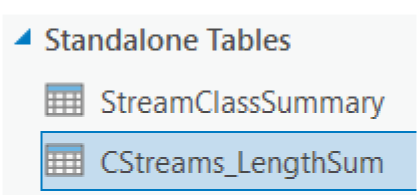
0 of 24 selected

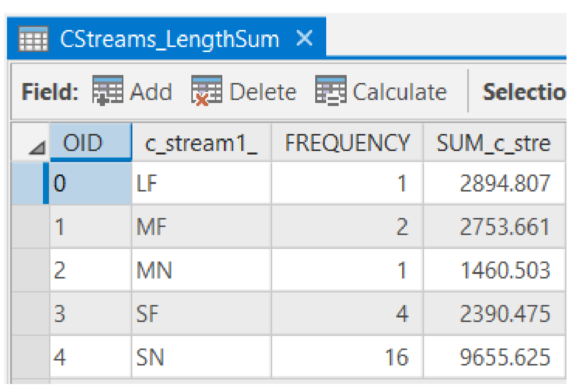
Find the length in feet of our various stream classes. Perform a summary of stream length by class.

1. Right click on the CLASS field associated with the Clipped Streams table (c_stream1) and choose Summarize.
2. Name the output table "CStreams_LengthSum.dbf" .
3. Make Field c_sream1.LENGTH and the Statistic Type Sum. The Case Field will be c_stream1.CLASS. Click Run.



Your output should look like the graphic below.





CStreams_LengthSum

OID	c_stream1_	FREQUENCY	SUM_c_stre
0	LF	1	2894.807
1	MF	2	2753.661
2	MN	1	1460.503
3	SF	4	2390.475
4	SN	16	9655.625

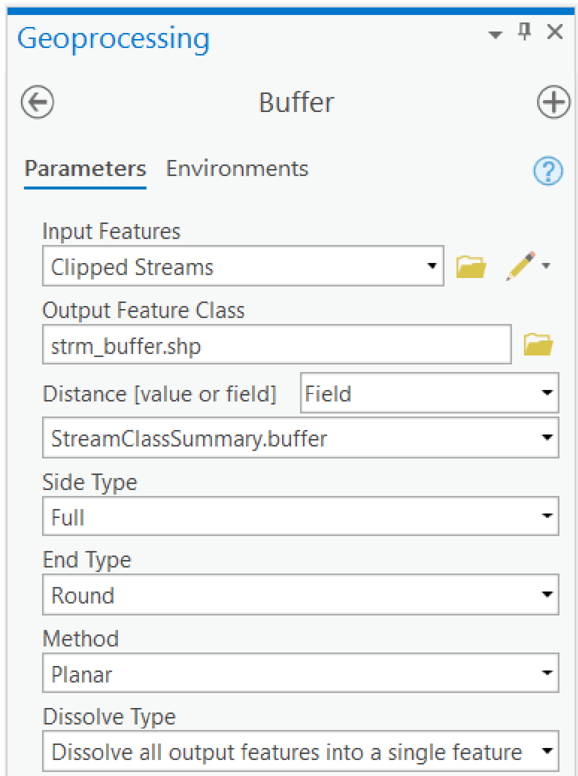
Practice using the Select by Attributes tool to explore the Class field in the next steps. Use the tool to select streams that are classified as large and fish bearing. After doing that, add streams that are medium and fish bearing to the selection.

Make sure to clear any selections before moving on by choosing Clear from the Selection menu. You may also want to close any open tables before moving on.

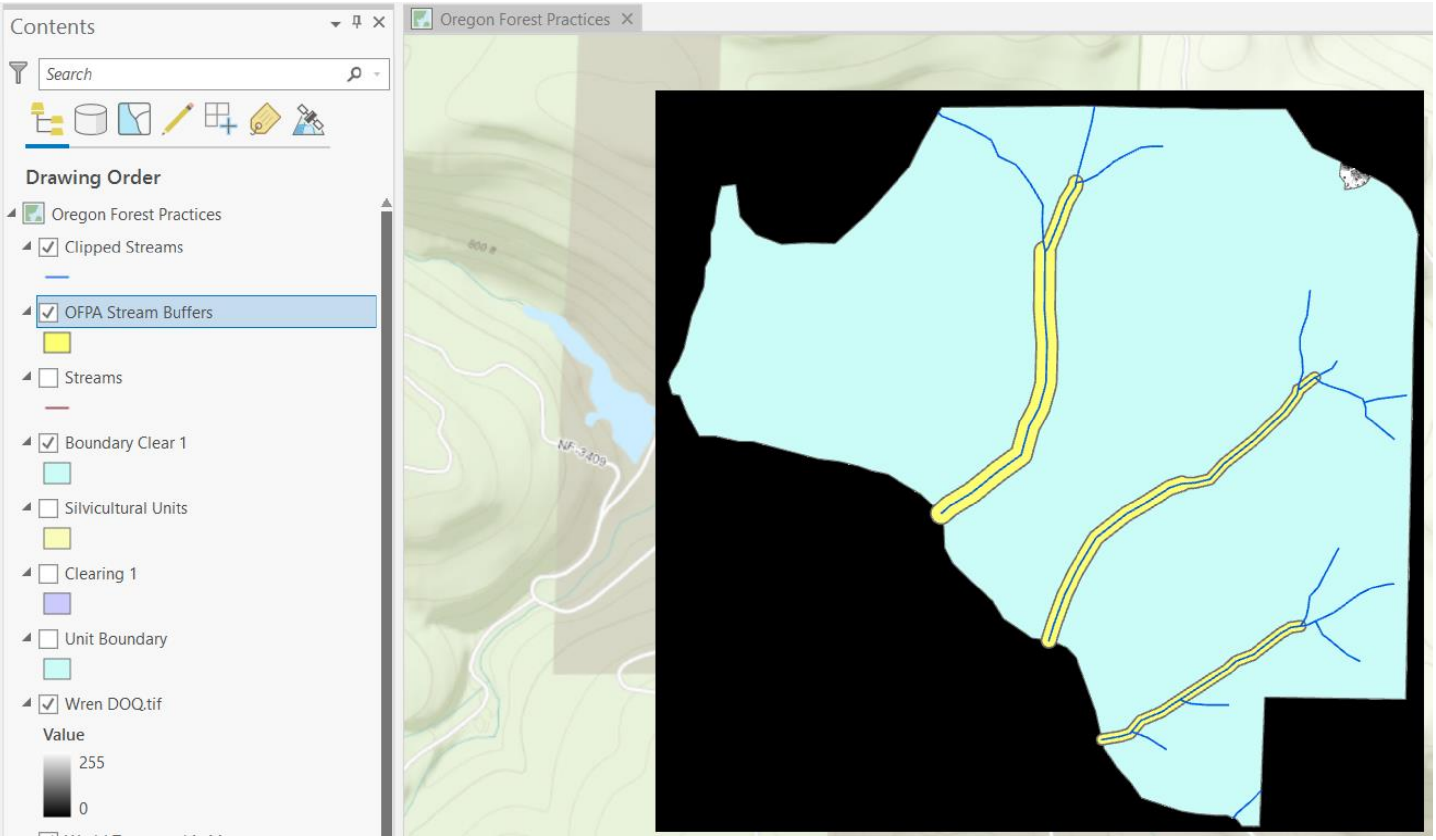
Use the information you've entered into the buffer field you just made to create buffers for Clipped Streams.

Search for the Buffer tool in the Geoprocessing window.

Use the Buffer dialog box to buffer the Clipped Streams layer and save the Output Feature Class as "strm_buffer.shp". Set the Distance option to Field and select StreamClassSummary.buffer. Set the Dissolve Type to "Dissolve all output features into a single feature."



The new buffer layer should appear in the Contents. Rename the layer "OFPA Stream Buffers" and adjust its symbology to see it clearly.



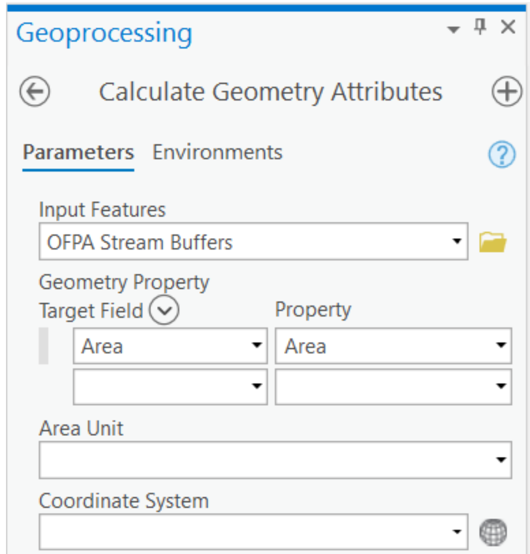
The area measurement for the OFPA Stream Buffers layer will need to be created and calculated like on pages 11-12. Click Add in the Field toolbar and create a field for Area setting the parameters below. Save the new field.

OFPA Stream Buffers | Fields: OFPA Stream Buffers

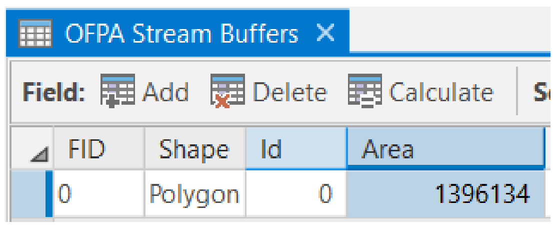
Current Layer: OFPA Stream Buffers

Visible	Read Only	Field Name	Alias	Data Type	Allow NULL	Highlight	Number Format	Default	Precision	Scale	Length
☑	☑	FID	FID	Object ID	☐	☐	Numeric		0	0	
☑	☐	Shape	Shape	Geometry	☐	☐			0	0	
☑	☐	Id	Id	Long	☐	☐	Numeric		6	0	
☑	☐	Area	Area	Long	☐	☐	Numeric		10	0	

Right click Area in the OFPA Stream Buffers table and select Calculate Geometry, setting the parameters below.

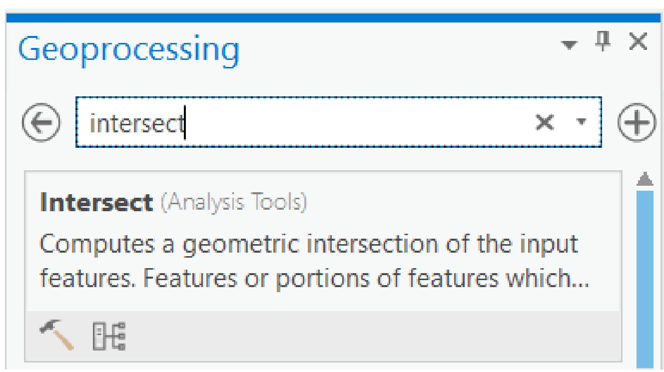


Check your buffer area results and close the attribute table.

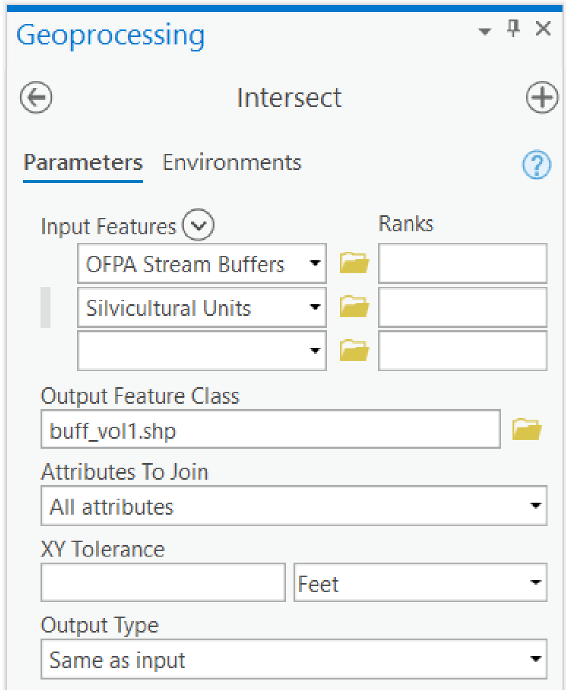


Perform an intersect operation between OFPA Stream Buffers and Silvicultural Units to determine mbf volumes (board feet of timber) within the buffer areas. The Silvicultural Units attribute table contains information about timber volumes; open and close it to view that information.

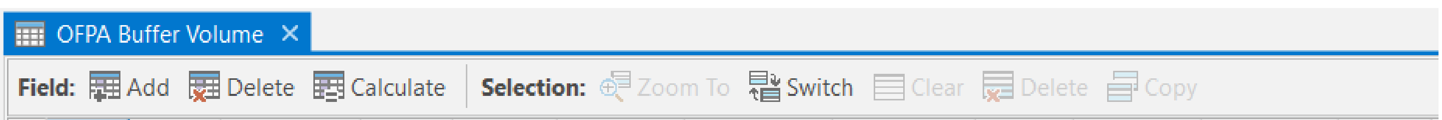
Search for the Intersect tool in the geoprocessing window.



Use the dropdown option in the Input Features box to select the OFPA Stream Buffers and Silvicultural Units layers. Write the output to your workspace as buff_vol1.shp. Click Run.

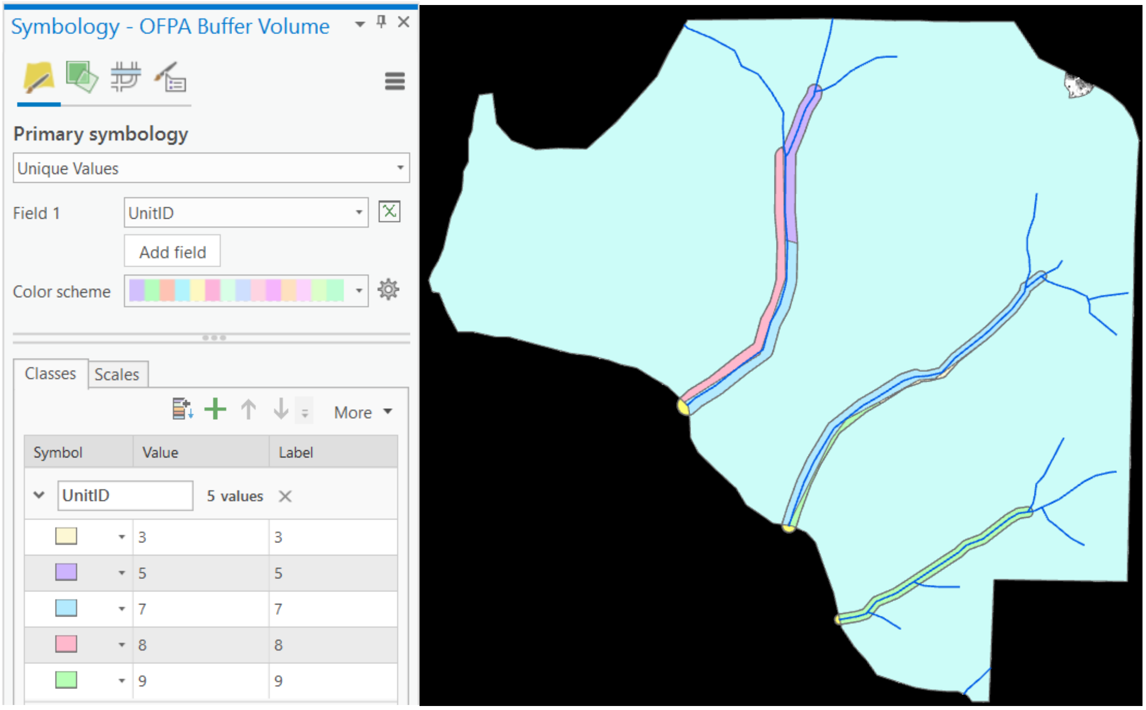


Rename the new layer OFPA Buffer Volume. Update the area measurements in the "Area" field like on pages 11-12 and 18-19.



FID	Shape	FID_strm_b	Id	Area	FID_silvun	AREA_1	PERIMETER	ACRES	MBF_UNT	MBF_ACRE	UnitID
0	Polygon	0	0	17739	2	2765174.66	8029.394	63.48	3698.16	58.257	3
1	Polygon	0	0	200864	4	3250432.311	8032.087	74.62	4110.49	55.086	5
2	Polygon	0	0	622271	6	4105342.953	11470.587	94.246	2850.73	30.248	7
3	Polygon	0	0	253277	7	4445457.717	9011.04	102.054	3866.14	37.883	8
4	Polygon	0	0	277679	8	6115313.626	12220.337	140.388	6428.5	45.791	9

You can change the Symbology of OFPA Buffer Volume to Unique Values to see where the OFPA Stream Buffers and Silvicultural Units layers intersect.



Save your map project and edits!

Let's add a field to the OFPA Buffer Volume layer that will quantify timber volume.

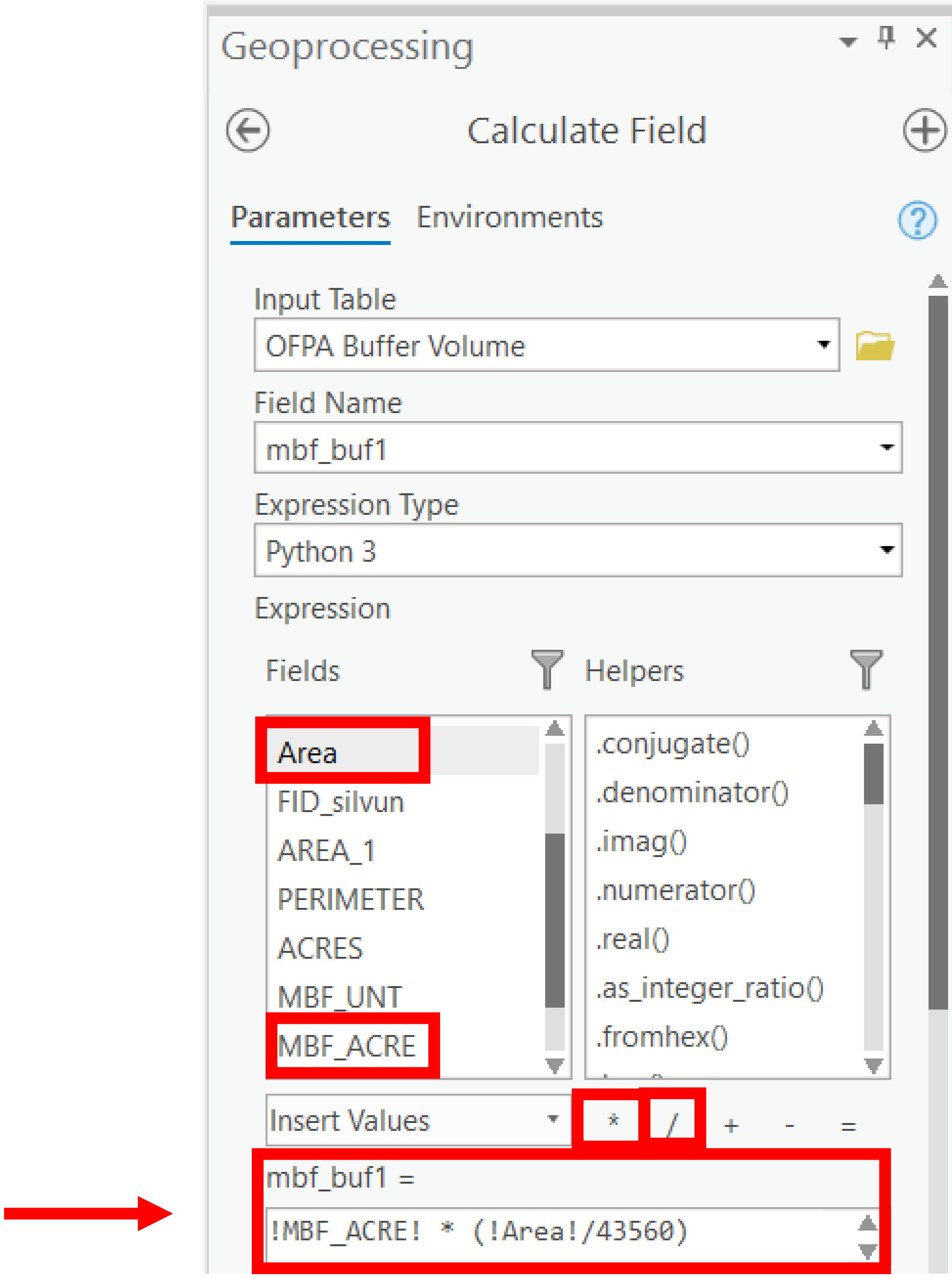
1. Choose Add from the Fields menu.
2. Enter "mbf_buf1" as the Name, Float Data Type, set the Precision to 6 and the Scale to 1. Save the field.

Current Layer: OFPA Buffer Volume

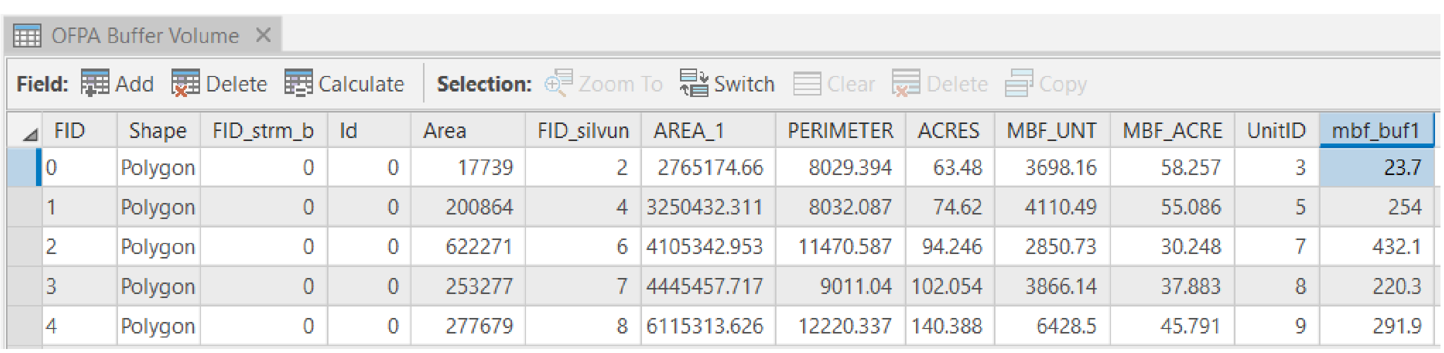
Visible	Read Only	Field Name	Alias	Data Type	Allow NULL	Highlight	Number Format	Default	Precision	Scale	Length
✓		Area	Area	Long			Numeric		10	0	
✓		FID_silvun	FID_silvun	Long			Numeric		10	0	
✓		AREA_1	AREA_1	Double			Numeric		18	3	
✓		PERIMETER	PERIMETER	Double			Numeric		18	3	
✓		ACRES	ACRES	Double			Numeric		18	3	
✓		MBF_UNT	MBF_UNT	Double			Numeric		9	2	
✓		MBF_ACRE	MBF_ACRE	Double			Numeric		10	3	
✓		UnitID	UnitID	Short			Numeric		4	0	
✓		mbf_buf1	mbf_buf1	Float			Numeric		6	1	

Right click on the mbf_buf1 field heading in the OFPA Buffer Volume attribute table and choose Calculate Field. Write an equation to multiply the mbf per acre in each silvicultural unit by the size of the unit (divided by 43560 to get the acreage). This will produce the total board feet in each silvicultural unit clipped to the buffer area.

Select fields and operators from the Calculate Field dialogue box by double-clicking on them and manually typing to build the equation: **mbf_buf1 = !MBF_ACRE! * (!Area!/43560)**

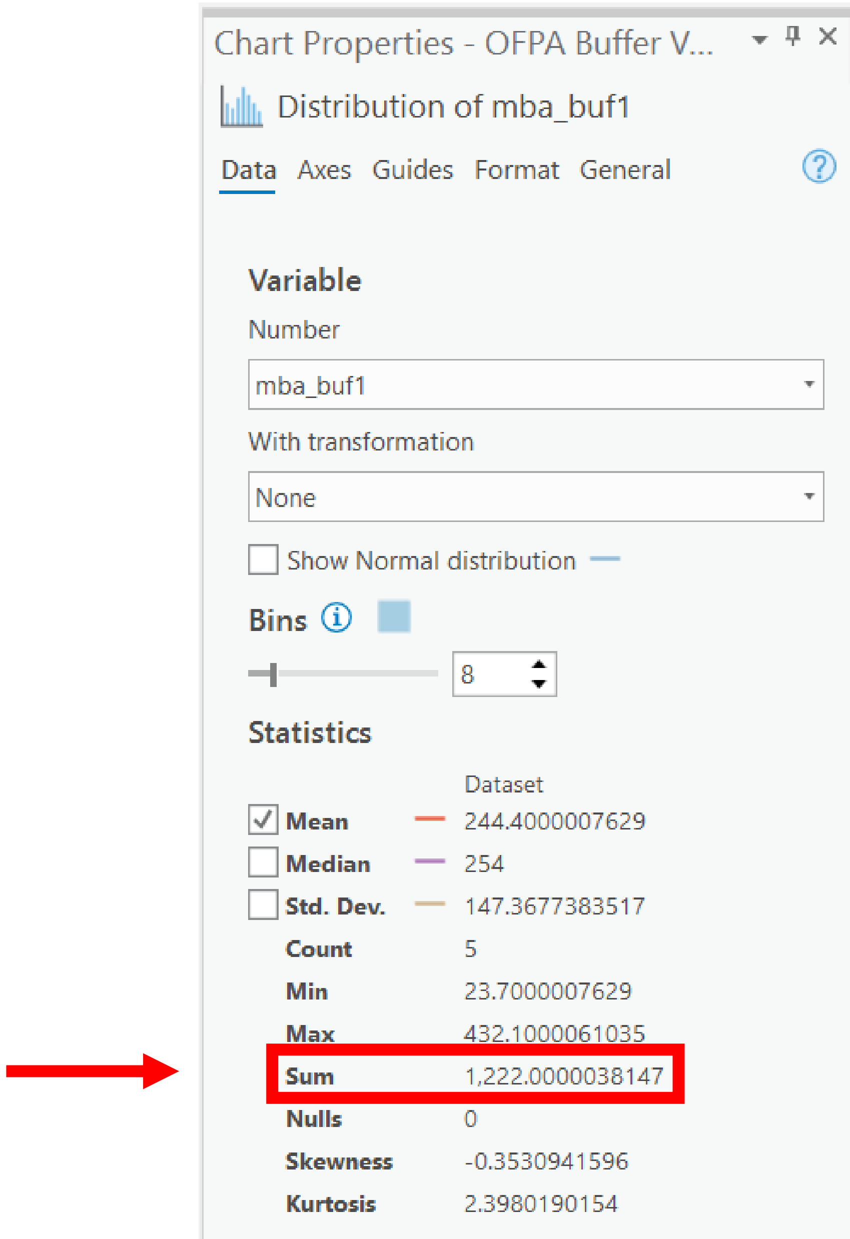


Click Run when finished. Check that the mbf_buf1 field was updated.



FID	Shape	FID_strm_b	Id	Area	FID_silvun	AREA_1	PERIMETER	ACRES	MBF_UNT	MBF_ACRE	UnitID	mbf_buf1
0	Polygon	0	0	17739	2	2765174.66	8029.394	63.48	3698.16	58.257	3	23.7
1	Polygon	0	0	200864	4	3250432.311	8032.087	74.62	4110.49	55.086	5	254
2	Polygon	0	0	622271	6	4105342.953	11470.587	94.246	2850.73	30.248	7	432.1
3	Polygon	0	0	253277	7	4445457.717	9011.04	102.054	3866.14	37.883	8	220.3
4	Polygon	0	0	277679	8	6115313.626	12220.337	140.388	6428.5	45.791	9	291.9

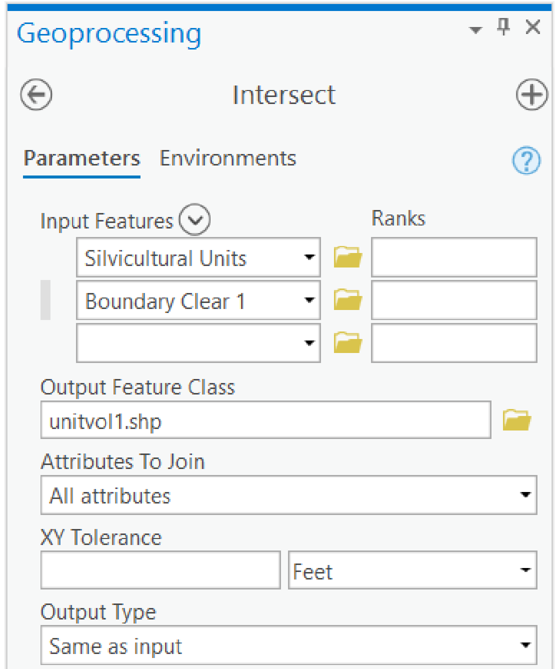
Right click on the mbf_buf1 field heading and click Statistics. Sum will give the mbf quantity for the entire buffer area (around 1222).



Let's calculate the total volume of timber available using the "Boundary Clear 1" layer.

First, perform an intersect between the Boundary Clear 1 layer and Silvicultural Units to determine mbf volumes within the Boundary Clear 1 layer. Search for the Intersect tool in the Geoprocessing window.

Use the drop-down box to select Silvicultural Units and Boundary Clear 1 as the Input Features. Write the result to your workspace with the name unitvol1.shp. Click Run.



Rename the new layer Unit Volume 1 and open its attribute table to **update its Area measurements.** FID 3, UnitID 4 will change slightly to account for Clearing 1, which we erased from Unit Boundary in earlier steps.

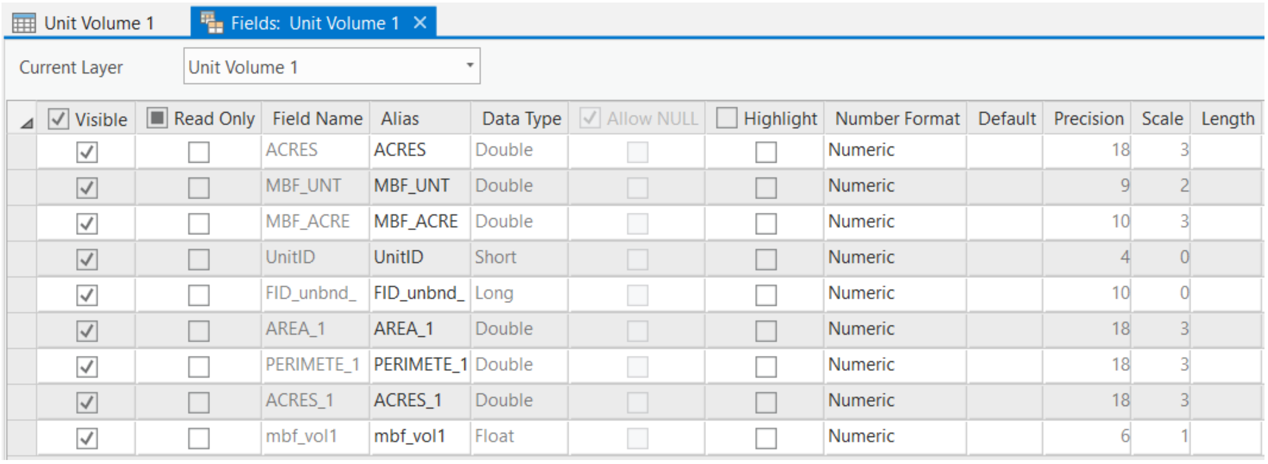
Unit Volume 1

Field: Add Delete Calculate **Selection:** Zoom To Switch Clear Delete Copy

FID	Shape	FID_silvun	AREA	PERIMETER	ACRES	MBF_UNT	MBF_ACRE	UnitID	FID_unbnd_	AREA_1	PERIMETE_1	ACRES_1
0	Polygon	0	977383.903	5233.215	22.438	1039.22	46.315	1	0	29973260.283	24716.939	689.136
1	Polygon	1	1664630.198	5530.241	38.215	447.67	11.715	2	0	29973260.283	24716.939	689.136
2	Polygon	2	2765174.66	8029.394	63.48	3698.16	58.257	3	0	29973260.283	24716.939	689.136
3	Polygon	3	2765076.705	6316.471	64.522	3746.06	58.059	4	0	29973260.283	24716.939	689.136
4	Polygon	4	3250432.311	8032.087	74.62	4110.49	55.086	5	0	29973260.283	24716.939	689.136
5	Polygon	5	3884448.209	8639.58	89.175	5570.85	62.471	6	0	29973260.283	24716.939	689.136
6	Polygon	6	4105342.953	11470.587	94.246	2850.73	30.248	7	0	29973260.283	24716.939	689.136
7	Polygon	7	4445457.717	9011.04	102.054	3866.14	37.883	8	0	29973260.283	24716.939	689.136
8	Polygon	8	6115313.626	12220.337	140.388	6428.5	45.791	9	0	29973260.283	24716.939	689.136

Let’s add a variable to the attribute table for Unit Volume 1 that will quantify timber volume for the updated Silvicultural units.

1. Choose Add from the Field menu in the Unit Volume 1 attribute table.
2. Enter “mbf_vol1” as the Name, Float Data Type, Precision 6, and Scale 1. Click Save.



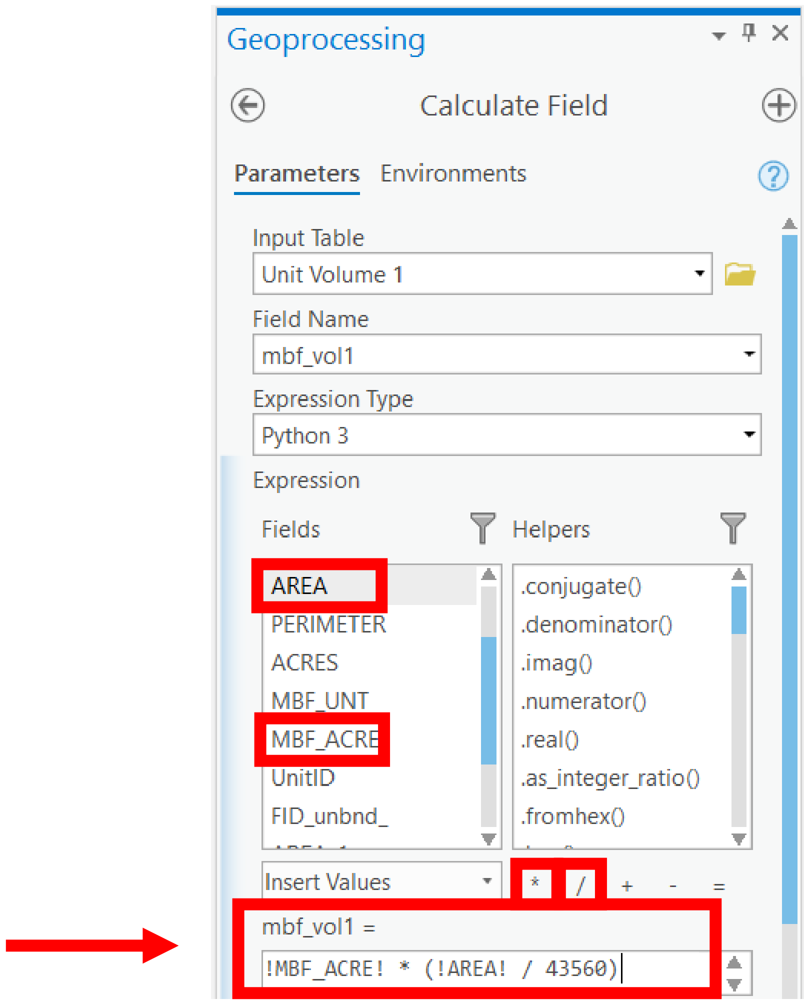
Unit Volume 1 | Fields: Unit Volume 1

Current Layer: Unit Volume 1

Visible	Read Only	Field Name	Alias	Data Type	Allow NULL	Highlight	Number Format	Default	Precision	Scale	Length
☑	☐	ACRES	ACRES	Double	☐	☐	Numeric		18	3	
☑	☐	MBF_UNT	MBF_UNT	Double	☐	☐	Numeric		9	2	
☑	☐	MBF_ACRE	MBF_ACRE	Double	☐	☐	Numeric		10	3	
☑	☐	UnitID	UnitID	Short	☐	☐	Numeric		4	0	
☑	☐	FID_unbnd_	FID_unbnd_	Long	☐	☐	Numeric		10	0	
☑	☐	AREA_1	AREA_1	Double	☐	☐	Numeric		18	3	
☑	☐	PERIMETE_1	PERIMETE_1	Double	☐	☐	Numeric		18	3	
☑	☐	ACRES_1	ACRES_1	Double	☐	☐	Numeric		18	3	
☑	☐	mbf_vol1	mbf_vol1	Float	☐	☐	Numeric		6	1	

Right click on the mbf_vol1 field heading in the Unit Volume 1 attribute table and select Calculate Field.

Select fields and operators from the Calculate Field dialogue box by double-clicking on them and manually typing to build the equation: **mbf_vol1 = !MBF_ACRE! * (!AREA!/43560)**

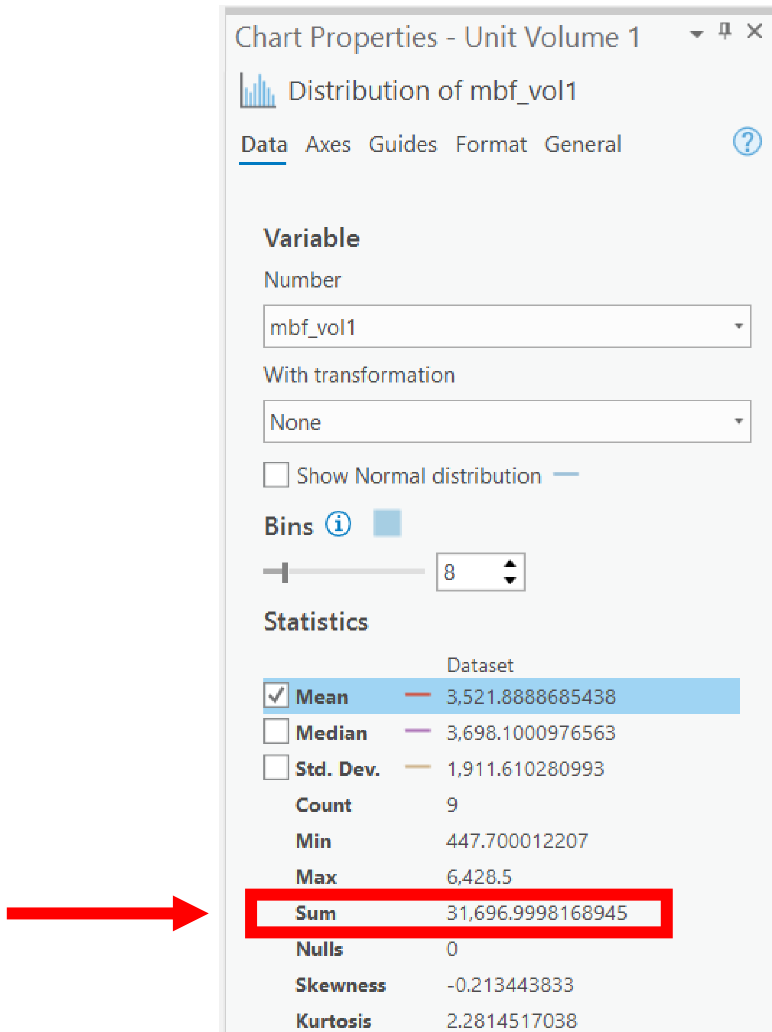


Click Run when finished. Check that the mbf_vol1 field was updated.

Field: Add Delete Calculate Selection: Zoom To Switch Clear Delete Copy

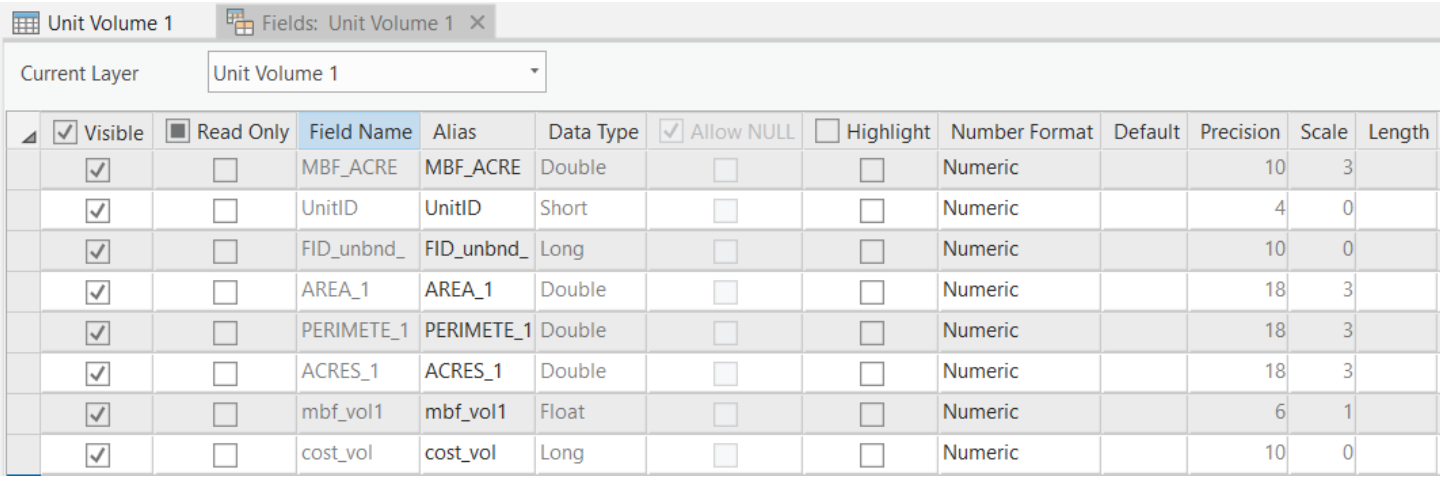
FID	Shape	FID_silvun	AREA	PERIMETER	ACRES	MBF_UNT	MBF_ACRE	UnitID	FID_unbnd_	AREA_1	PERIMETE_1	ACRES_1	mbf_vol1
0	Polygon	0	977383.903	5233.215	22.438	1039.22	46.315	1	0	29973260.283	24716.939	689.136	1039.2
1	Polygon	1	1664630.198	5530.241	38.215	447.67	11.715	2	0	29973260.283	24716.939	689.136	447.7
2	Polygon	2	2765174.66	8029.394	63.48	3698.16	58.257	3	0	29973260.283	24716.939	689.136	3698.1
3	Polygon	3	2765076.705	6316.471	64.522	3746.06	58.059	4	0	29973260.283	24716.939	689.136	3685.4
4	Polygon	4	3250432.311	8032.087	74.62	4110.49	55.086	5	0	29973260.283	24716.939	689.136	4110.5
5	Polygon	5	3884448.209	8639.58	89.175	5570.85	62.471	6	0	29973260.283	24716.939	689.136	5570.8
6	Polygon	6	4105342.953	11470.587	94.246	2850.73	30.248	7	0	29973260.283	24716.939	689.136	2850.7
7	Polygon	7	4445457.717	9011.04	102.054	3866.14	37.883	8	0	29973260.283	24716.939	689.136	3866.1
8	Polygon	8	6115313.626	12220.337	140.388	6428.5	45.791	9	0	29973260.283	24716.939	689.136	6428.5

Right click on the mbf_vo1 field heading and click Statistics. The sum should give the total timber volume potentially available (around 31,697 mbf) in the study area (Boundary Clear 1). This value will differ slightly with each student's unique clearing polygons.



Calculate the dollar amount for this timber volume assuming a $500.00 value per mbf.

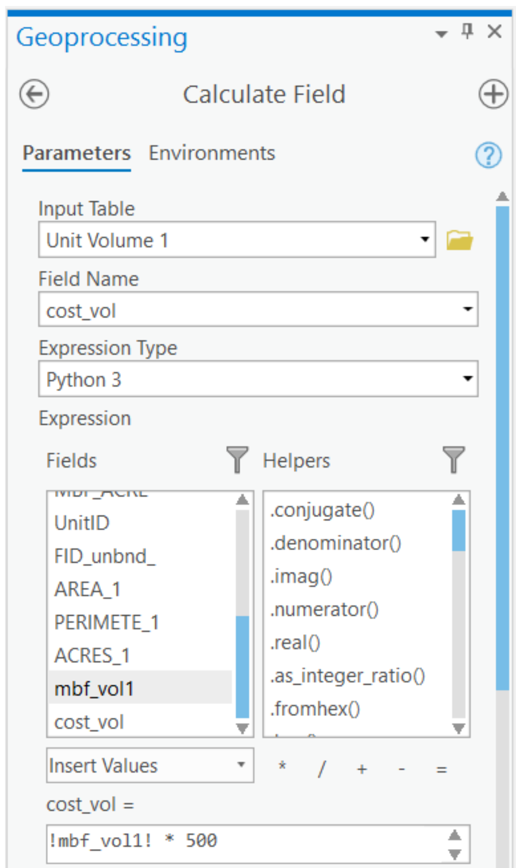
1. Click Add in the Field menu of the Unit Volume 1 attribute table.
2. Enter "cost_vol" as the Name, Long Data Type. Leave all other defaults. Click Save.



Visible	Read Only	Field Name	Alias	Data Type	Allow NULL	Highlight	Number Format	Default	Precision	Scale	Length
☑	☐	MBF_ACRE	MBF_ACRE	Double	☐	☐	Numeric		10	3	
☑	☐	UnitID	UnitID	Short	☐	☐	Numeric		4	0	
☑	☐	FID_unbnd_	FID_unbnd_	Long	☐	☐	Numeric		10	0	
☑	☐	AREA_1	AREA_1	Double	☐	☐	Numeric		18	3	
☑	☐	PERIMETE_1	PERIMETE_1	Double	☐	☐	Numeric		18	3	
☑	☐	ACRES_1	ACRES_1	Double	☐	☐	Numeric		18	3	
☑	☐	mbf_vol1	mbf_vol1	Float	☐	☐	Numeric		6	1	
☑	☐	cost_vol	cost_vol	Long	☐	☐	Numeric		10	0	

Right click on the cost_vol field heading in the Unit Volume 1 attribute table and select Calculate Field.

Select fields and operators from the Calculate Field dialogue box by double-clicking on them and manually typing to build the equation: **cost_vol = !mbf_vol1! * 500**



Click Run when finished. Check that the cost_vol field was updated. The first entry for Silvicultural Unit 1 shows that it contains 1039.2 mbf; the cost of timber volume contained in the unit is $519,600.

Unit Volume 1

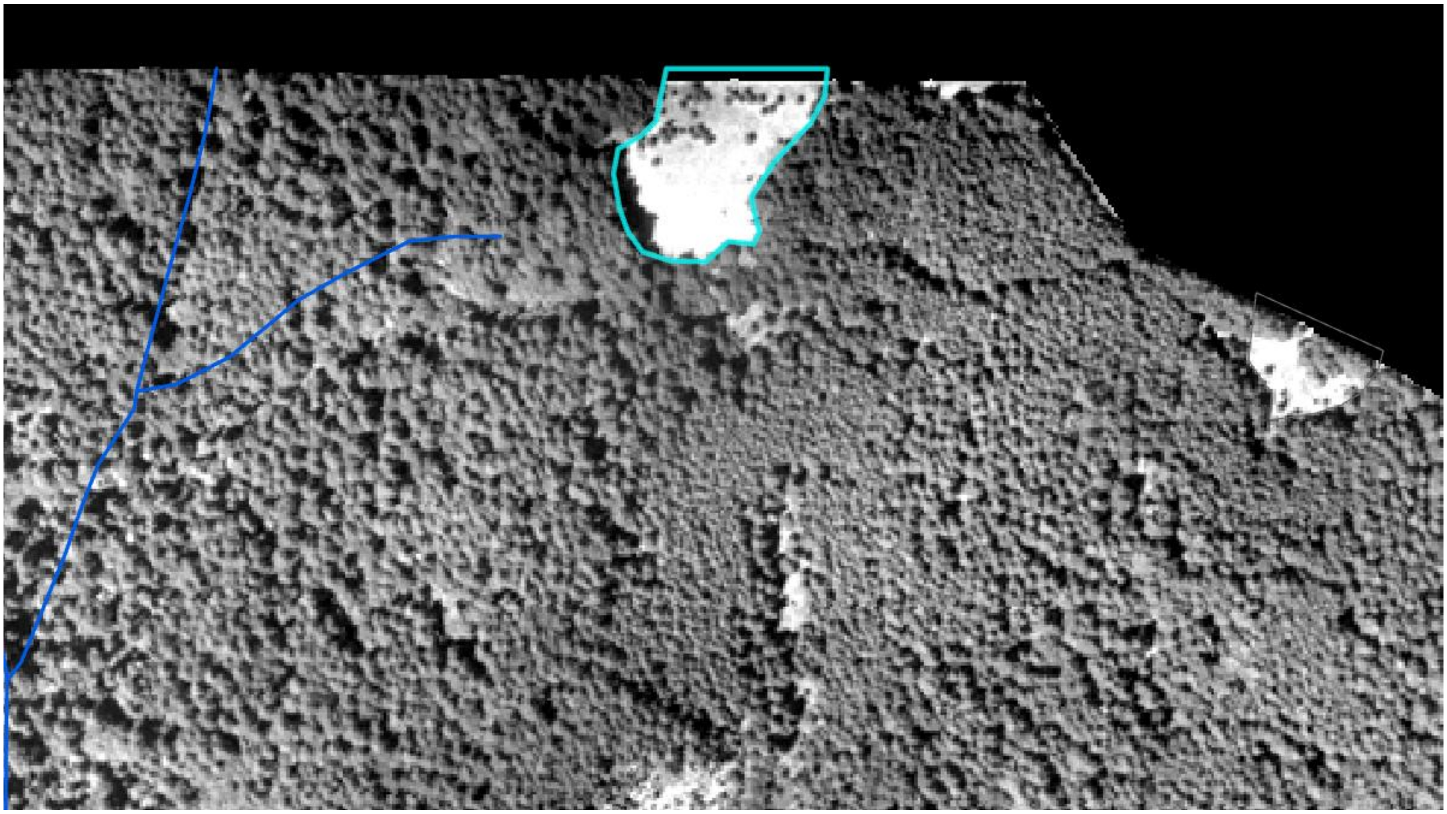
Field: Add Delete Calculate **Selection:** Zoom To Switch Clear Delete Copy

FID	Shape	FID_silvun	AREA	PERIMETER	ACRES	MBF_UNT	MBF_ACRE	UnitID	FID_unbnd_	AREA_1	PERIMETE_1	ACRES_1	mbf_vol1	cost_vol
0	Polygon	0	977383.903	5233.215	22.438	1039.22	46.315	1	0	29973260.283	24716.939	689.136	1039.2	519600
1	Polygon	1	1664630.198	5530.241	38.215	447.67	11.715	2	0	29973260.283	24716.939	689.136	447.7	223850
2	Polygon	2	2765174.66	8029.394	63.48	3698.16	58.257	3	0	29973260.283	24716.939	689.136	3698.1	1849050
3	Polygon	3	2765076.705	6316.471	64.522	3746.06	58.059	4	0	29973260.283	24716.939	689.136	3685.4	1842700
4	Polygon	4	3250432.311	8032.087	74.62	4110.49	55.086	5	0	29973260.283	24716.939	689.136	4110.5	2055250
5	Polygon	5	3884448.209	8639.58	89.175	5570.85	62.471	6	0	29973260.283	24716.939	689.136	5570.8	2785400
6	Polygon	6	4105342.953	11470.587	94.246	2850.73	30.248	7	0	29973260.283	24716.939	689.136	2850.7	1425350
7	Polygon	7	4445457.717	9011.04	102.054	3866.14	37.883	8	0	29973260.283	24716.939	689.136	3866.1	1933050
8	Polygon	8	6115313.626	12220.337	140.388	6428.5	45.791	9	0	29973260.283	24716.939	689.136	6428.5	3214250

Save your map project and edits.

LAB 5 Application: Using an Orthophoto to Update a Forest Inventory
Calculating Timber Volumes

Your first task is to again calculate timber volume from the silvicultural units. However, a field forester has identified another clearing that must be removed from consideration. This area is to the west of the first clearing we identified and is outlined in the graphic below. Create a new Clearing 2 shapefile outlining the clearing (beware of the shadows in the southwestern corner). Make sure the northern part of the new shapefile extends beyond the edge of the study area.



Your second task is to calculate mbf volumes for streams based on updated RMA stream buffer values from the IMST. The only true differences are in the non-fish bearing streams. We will compare your results to our earlier figures to determine the amount of timber that could be potentially set aside if this policy were enacted. A table is included below that gives updated values for proposed buffer widths.

Table 2. IMST: Riparian Management Areas.

	Type F	Type N
Size	Fish Bearing	Non-Fish
Large	100 feet	100 feet
Medium	70 feet	70 feet
Small	50 feet	50 feet

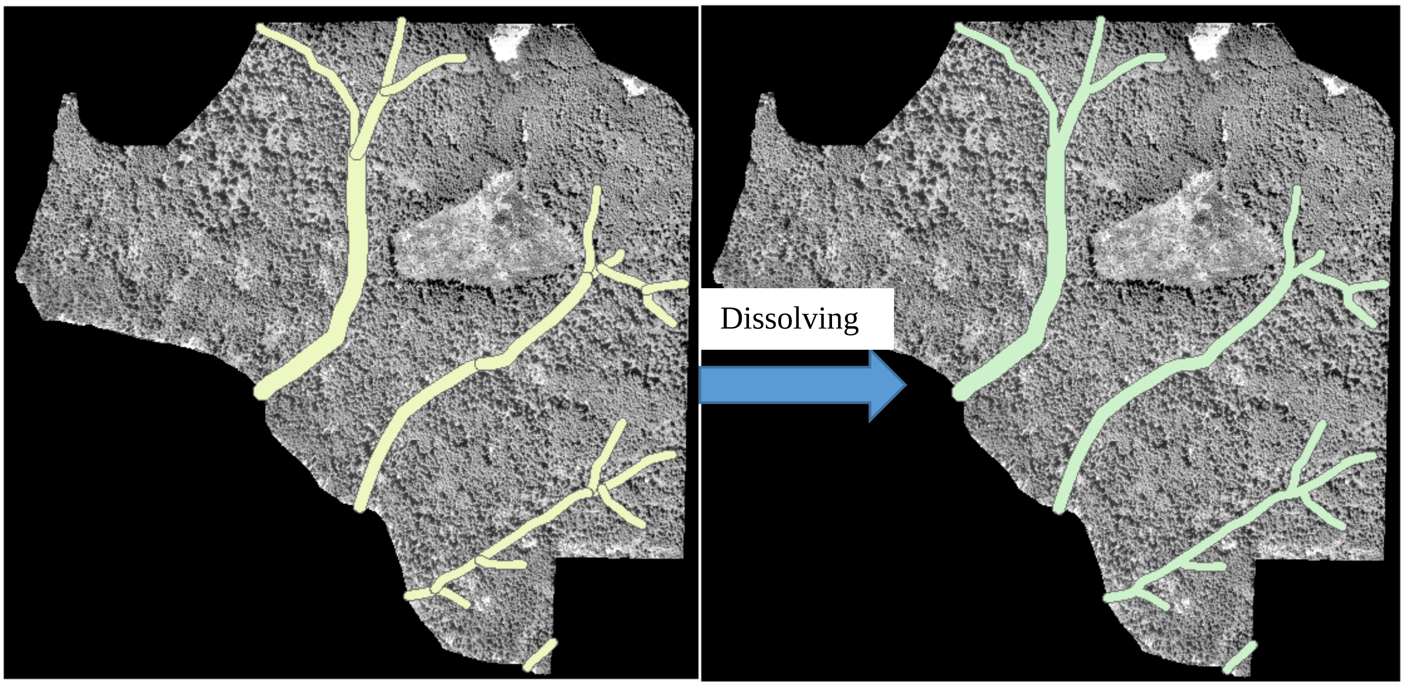
Your efforts in completing this project should follow the same sequences presented in the lab exercise.

Create a new data frame named "IMST RMAs" and copy the layers you'll need into the new data frame. **You should work with the layers from the lab exercise that have the Clearing 1 already removed.** Layers you should copy include:

Clipped Streams
Boundary Clear 1
Unit Volume 1
Silvicultural Units
Wren DOQ

When buffering, you should set the Dissolve Type to ALL in the Buffer geoprocessing window. If you forget you can use the Dissolve tool as we did in Lab 4 to make sure the stream buffers become one polygon feature.

Buffer layers before and after being dissolved, should look like the following pictures.



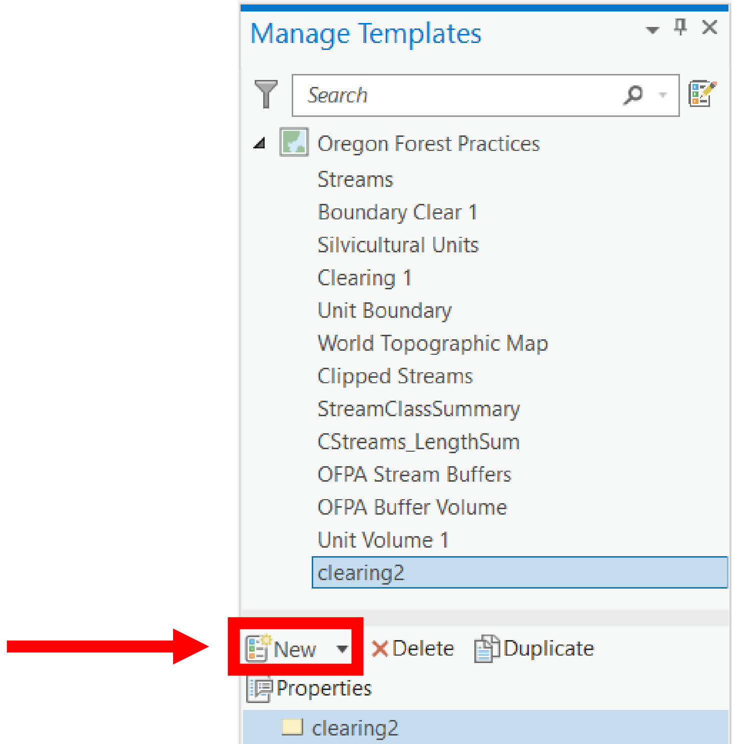
Pay attention to the names you assign output files and write all outputs to your workspace folder. It will probably be helpful for you to change the names of shapefiles you create in the Contents as your work progresses. Don't forget to save your map project file and edits as you work.

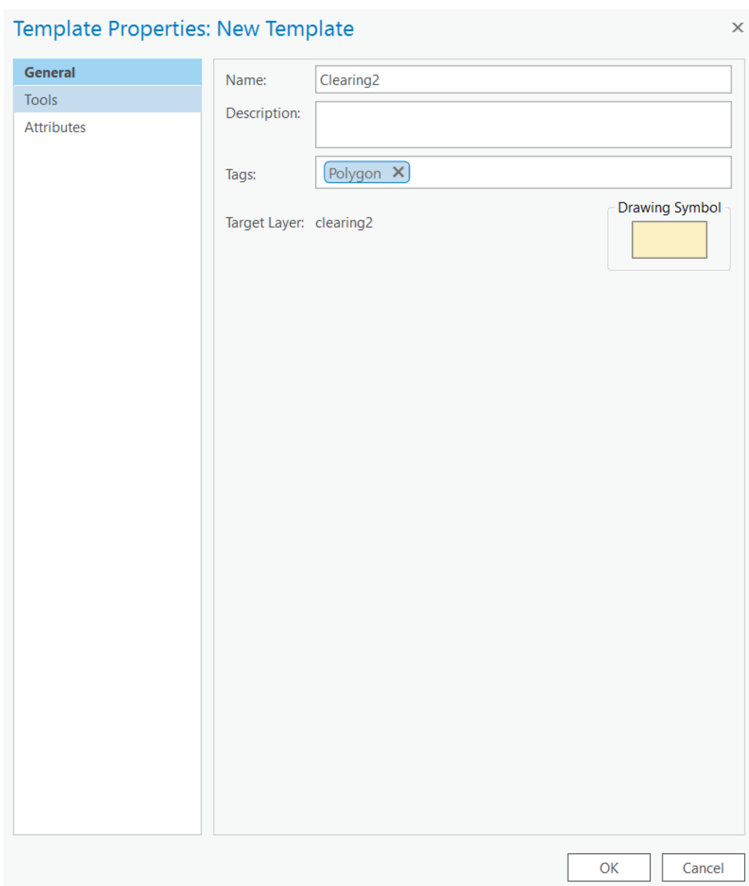
Please read the following section before you start to create a new shapefile of the second clearing.

You may also need to establish a template in order to edit a new shapefile of the second clearing. You will need to do this if your "Clearing2" shapefile does not appear in the list of layers in the Create Features window after you've created the shapefile in Catalog, added it to your Contents, and chosen Create from the Edit toolbar. Activate "Clearing2" in the Contents as the file to edit.

If you don't see the shapefile you want to edit, click on the Managed Templates button at the top right of the Create Features window.

Click on the Clearing 2 layer in the list of layers in the Manage Templates window and select New > New Template. Name the new template Clearing2 and click OK.





Assignment 5. Based on your output, please answer the following questions. You may work on this assignment individually or in teams of two. Type your answers and turn in at the beginning of the next lab meeting. Be sure to include your name(s), lab day (e.g. Tuesday 10 AM), assignment number, and course title with your answers. 4 points total. Report measurements to the nearest whole unit (no decimals).

5A.

1. What is the area in hectares of the silvicultural unit that contains the second clearing before the second clearing has been removed from the unit?

2. What is the area in hectares of the silvicultural unit that contains the second clearing after the second clearing has been removed from the unit?

3. What is the potential area in acres of the stream buffers recommended by the IMST that fall within the silvicultural unit that has a UnitID value of 4?

4. What is the potential timber volume in mbf contained within stream buffers as recommended by the IMST that fall within the silvicultural unit that has a UnitID value of 4?

5B. Prepare a map that shows three layers together as the focus of the map: the shapefile of the second clearing, the orthophotograph quadrangle, and the IMST stream buffers. No inset (locational map) is required but all other required map features should be present. 3 points.