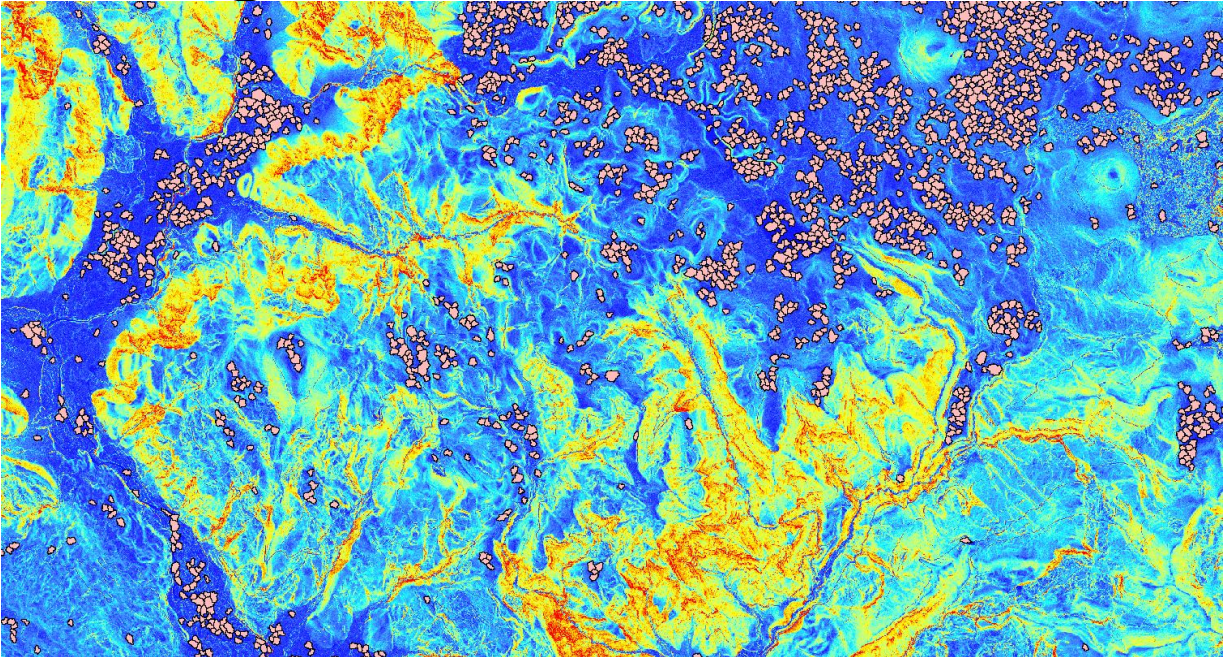


EXERCISE 4

Landing Zone Identification



Introduction

Now that you have exported the results from eCognition, you can load them into ArcMap to do further analysis. In ArcMap you are going to generate statistics related to canopy height, canopy cover and slope for each of the segment polygons that you exported from eCognition. A max canopy height statistic will be used to exclude those segments with canopy heights above 150 feet, which is what is considered old growth in this area. Then you will buffer the remaining polygons and run Zonal Stats on the buffers to provide additional information about the surroundings of each potential landing zone. The segments will now be referred to as potential landing zones, or **PLZs** for short.

Objectives

- Eliminate potential landing zones that contain old growth
- Begin generating a suite of statistics for each potential landing zone
- Use a 10-meter buffer to describe the surrounding forest

Required Data

- **LandingZones.mxd**—ArcMap workspace that you saved in Exercise 1



- **CandidateStands.shp**—Shapefile that contains the candidate stands that could potentially require a helicopter landing zone
- **LandingZones_Segments.shp**—Shapefile that was exported from eCognition
- **CanopyHeight.tif**—half-meter canopy height raster. This would be CanopyHeight_Clip.tif if you used the data from the T Drive.
- **CanopyCover.tif**—10-meter canopy cover raster. This would be CanopyCover_Clip.tif if you used the data from the T Drive.
- **Roads.shp**—Shapefile containing roads within the study area
- **NHD_lines.shp**—Shapefile containing hydrography data for the study area

Prerequisites

- **Install Esri ArcMap on computer and have basic understanding of how to use the software.**





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Part 1: Set Up ArcMap

A. Open LandingZones.mxd

1. Navigate to your **LandingZones** (C:\LandingZones) folder and double click **LandingZones.mxd**.

B. Add Data

1. Click the **Add Data** button (see below).



2. Navigate to the **LandingZones** folder and add **LandingZones_Segments.shp** (C:\LandingZones\eCognition_Outputs).
3. Also add **CanopyHeight.tif**, **CanopyCover.tif** and **CandidateStand.shp** from the **Rasters** and **Shapefile** folders respectively if they aren't still in the saved .mxd.

C. Activate Spatial Analyst Extension

1. Click on the **Customize** drop down at the top of the ArcMap window and select **Extensions**.
2. In the Extensions window, click the box next to **Spatial Analyst** to turn it on and click **Close**.
 - i. You can now access and use all of the tools in the Spatial Analyst toolbox.

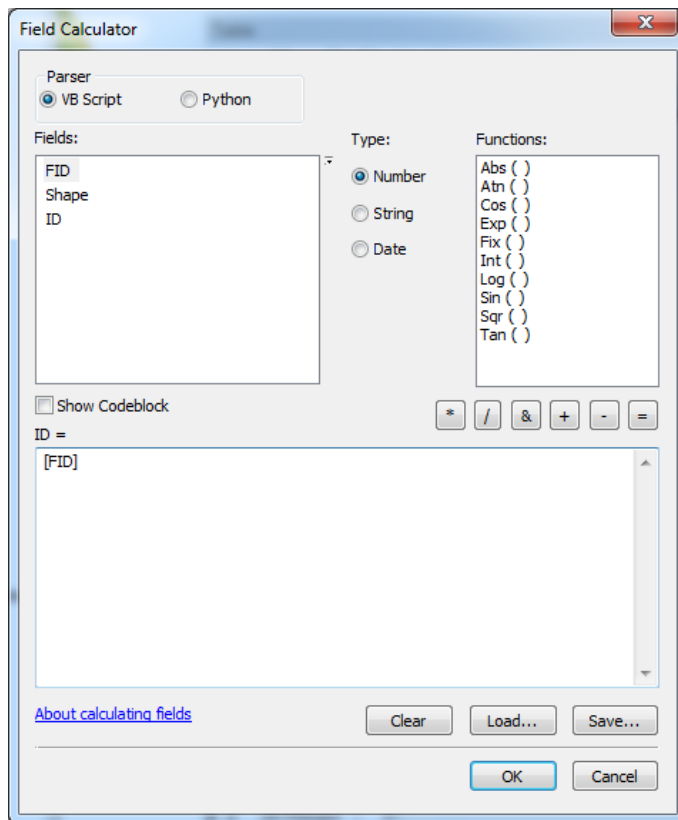
Part 2: Edit Attribute Table

Now that you have generated PLZ sites based on their slope, area and shape components, you will need to incorporate a variety of canopy and topography related statistics that describe each potential landing zone. Before generating all of the zonal statistics for the PLZs, you will need to add a variety of fields to the LandingZones_Segments attribute table. You will populate these fields later in this exercise with values from the zonal statistics tables that you will generate in a following section.

A. Populate ID Column

It is important to populate the **ID** column in this shapefile because the FID numbers will automatically reorder themselves whenever a shape is deleted from the shapefile.

1. Right click **LandingZones_Segments** and select **Open Attribute Table**.
2. Next, right click the ID column and select **Field Calculator**. Click yes to close the initial popup warning.
3. In the Field Calculator window, double click **FID** in the **Fields:** section to add it to the calculator.
4. Click **OK** (see below).



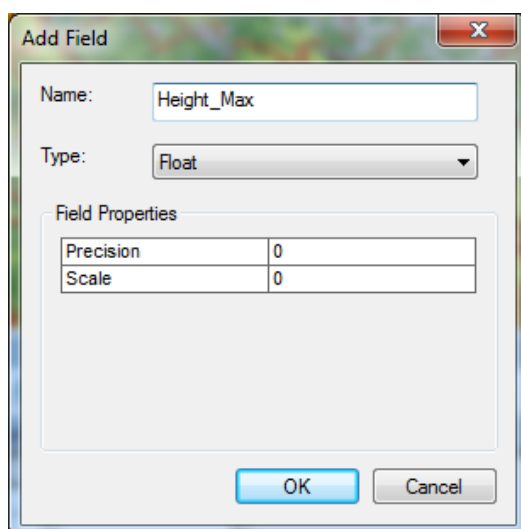
- i. This will populate the ID column with the same numbers in the FID column. Now, the ID column should be the primary identifier, as these numbers will remain the same, while the FID will reorder if the shapefile is altered at all.

B. Add Fields to Attribute Table

1. Right click **LandingZones_Segments** in your TOC and click **Open Attribute Table**.
2. Click the **Table Options** menu in the top left of the attribute table (see below).



3. Click **Add Field**.
4. In the **Add Field** window, type in **Height_Max** as the Name and change the Type to **Float**.
5. Click **OK** (see below).



- i. Notice that a new column is added to the far right of the table.
6. Repeat steps 2-5, naming the new fields **HeightMean**, **Height_STD**, **Cover_Max**, **Cover_Mean**, **Cover_STD**, **Slope_Max**, **Slope_Mean**, **Slope_STD** respectively. Be sure to set the **type** of each new field to **Float**!
- i. This will leave you with a total of 9 new columns.
7. The Attribute Table should now look like the below image.

FID	Shape	ID	Height_Max	HeightMean	Height_STD	Cover_Max	Cover_Mean	Cover_STD	Slope_Max	Slope_Mean	Slope_STD
0	Polygon	0	0	0	0	0	0	0	0	0	0
1	Polygon	1	0	0	0	0	0	0	0	0	0
2	Polygon	2	0	0	0	0	0	0	0	0	0
3	Polygon	3	0	0	0	0	0	0	0	0	0
4	Polygon	4	0	0	0	0	0	0	0	0	0
5	Polygon	5	0	0	0	0	0	0	0	0	0
6	Polygon	6	0	0	0	0	0	0	0	0	0
7	Polygon	7	0	0	0	0	0	0	0	0	0
8	Polygon	8	0	0	0	0	0	0	0	0	0
9	Polygon	9	0	0	0	0	0	0	0	0	0
10	Polygon	10	0	0	0	0	0	0	0	0	0

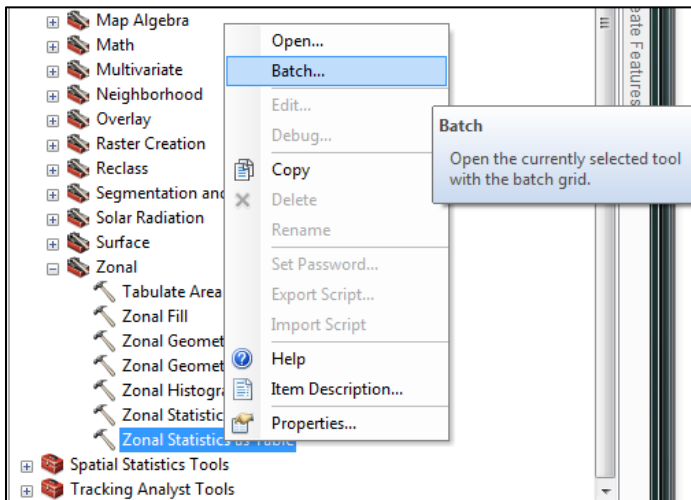
- i. Since there is a 10 character limit on the field names, you will need to add detail to these names in a later exercise when you bring the table into Excel.

Part 3: Generate Zonal Statistics

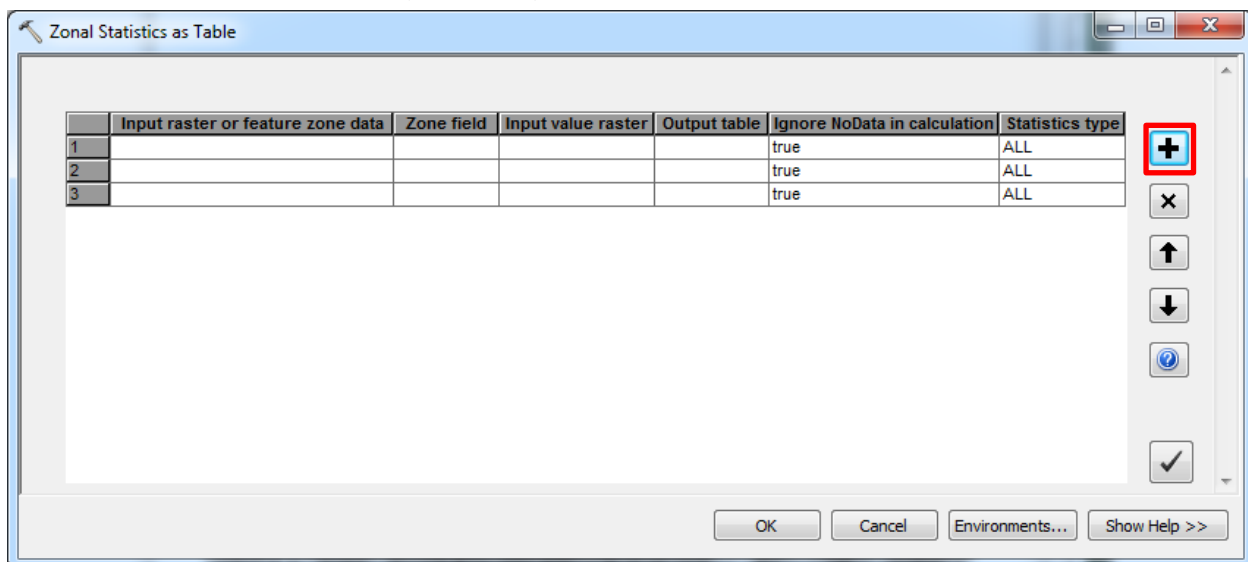
In order to generate the zonal statistics efficiently, you will use the Batch option, which is available for all tools in the ArcToolbox. It allows users to perform a single run of a tool when they otherwise would have to run the tool multiple times to get different outputs. You will use the batch function in this section to generate zonal statistics for canopy height, canopy cover and slope.

A. Run Batch Zonal Statistics

1. Navigate to the **Zonal Statistics as Table** tool by opening the ArcToolbox and navigating to **Spatial Analyst Tools, Zonal**.
2. Instead of left-clicking on the tool to open it, right-click it and select **Batch** (see below).

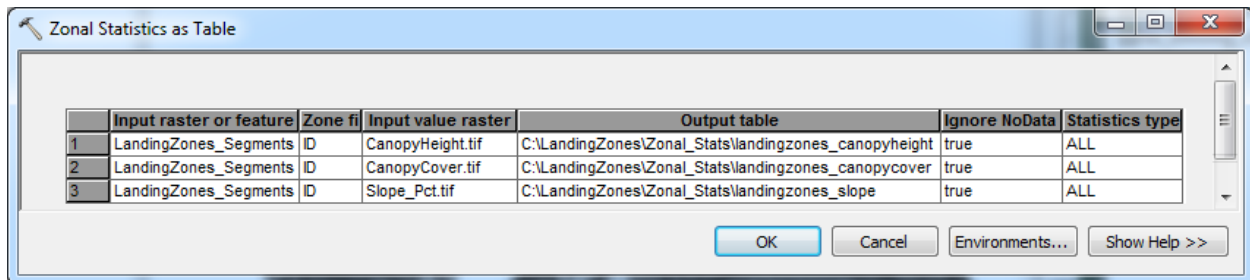


3. In the batch Zonal Statistics as Table window that opens, click the plus sign on the right side to add two more rows (see below).

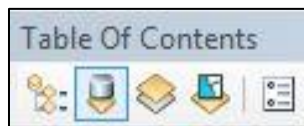


4. In the **Input raster or feature zone data** field, click within the cell, then click the drop down arrow and select **LandingZones_Segments** for each of the three rows.
 - i. Alternatively, you can select the cell and then double-click it to open up a selection window.
5. Click within each cell under **Zone field**, click the drop down arrow, then select **ID** and click **OK** for each of the three rows.
6. In the **Input raster or feature zone data** field, select **CanopyHeight.tif** for the first row.
7. Repeat this for rows 2 and 3, using **CanopyCover.tif** and **Slope_Pct.tif** respectively.

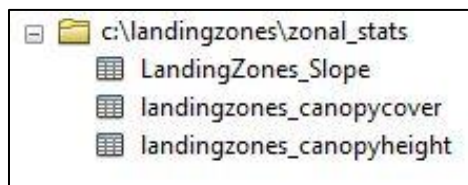
8. Double click the first cell under the **Output table** field.
9. Click the folder icon in the **Zonal Statistics as Table: 1** window that opens up, navigate to the **Zonal_Stats** folder (C:\LandingZones\Zonal_Stats) and name the output **LandingZones_CanopyHeight**.
10. Click **Save** and then click **OK** to get back to the batch window.
11. Repeat steps **9** and **10**, but name the outputs **LandingZones_CanopyCover** and **LandingZones_Slope** for rows 2 and 3 respectively.
12. Leave the other two fields as their default: **true** and **ALL**.
13. Click **OK** to run the Zonal Statistics as Table tool (see below).



- i. When the tool is done running, your TOC will automatically change to the **List By Source** display (see below). The default is the **List By Drawing Order** on the far left, but that option will not display the tables that were output from this process.



14. You may notice that only one of the tables has been added to your TOC. You will need to add that data manually by clicking the **Add Data** button at the top of your ArcMap and navigating to the **Zonal_Stats** folder (C:\LandingZones\Zonal_Stats).
- i. Once those tables are added to your ArcMap session, you should see the below section in your TOC.



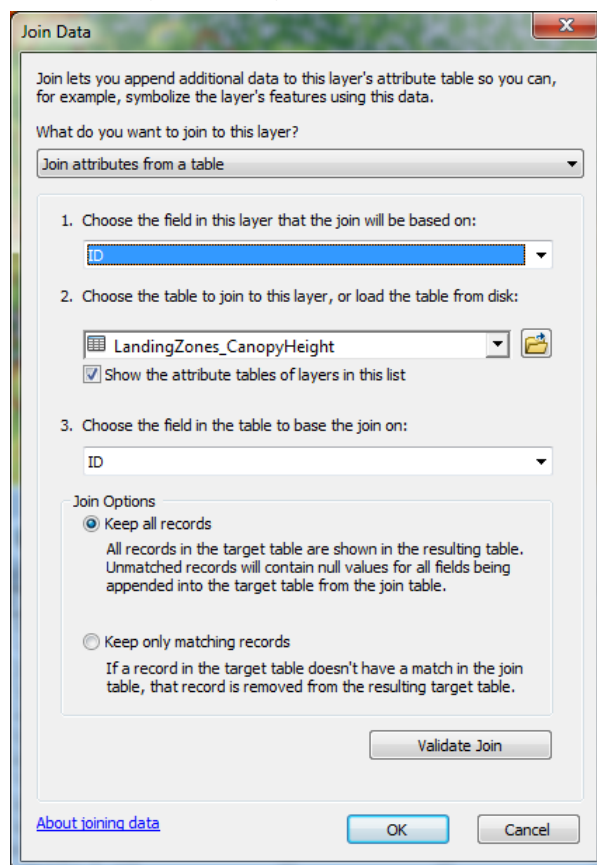
15. Right click **LandingZones_Slope** and click **Open**.
16. Notice that in addition to the statistical columns (Count, Area, Min, Max, etc.) there are Rowid and ID columns. The **ID** column is the field you should use to join tables because this is not a default value assigned to the table. **Rowid**, on the other hand, contains default values similar to the FID column of a shapefile.
17. Close the Table.

Part 4: Join Tables With Segments

In this section, you will join all of the zonal statistics tables to the LandingZones_Segments shapefile and then use those tables to transfer statistics to the fields you created in the previous section.

A. Join Tables

1. Right-click **LandingZones_Segments** in the TOC and select **Open Attribute Table**.
2. Click the **Table Options** menu, hover over **Joins and Relates** and click **Join**.
3. In the **Join Data** window that pops up, click the drop down in section 1 and select **ID**.
4. Select **LandingZones_CanopyHeight** in section 2.
5. Select **ID** in section 3 and ensure that the Join Options are set to **Keep All Records**.
6. Click **OK** (see below).



- i. Click **Yes** if prompted to create an index.
7. Your attribute table should now look similar to the below table. The red box indicates the portion of the table that has been joined to the original LandingZones_Segments table.

Table

LandingZones_Segments

Slope_Mean	Slope_STD	Rowid	ID *	COUNT	AREA	MIN	MAX	RANGE	MEAN	STD	SUM
0	0	1	0	21732	5433	0.010398	61.047695	61.037298	37.956234	14.045283	824864.870
0	0	2	1	16560	4140	0.018682	55.359009	55.340327	29.126589	15.021475	482336.314
0	0	3	2	22572	5643	0.00963	59.71484	59.70521	34.140276	15.670821	770614.313
0	0	4	3	53440	13360	0.01135	56.432255	56.420905	32.094623	14.209409	1715136.67
0	0	5	4	19868	4967	0.0306	58.985001	58.954401	37.136307	14.099116	737824.156
0	0	6	5	36036	9009	0.007454	54.142151	54.134697	6.854418	10.460814	247005.798
0	0	7	6	18796	4699	0.042877	57.027237	56.98436	38.948036	10.867053	732067.282
0	0	8	7	37072	9268	0.020387	40.278694	40.258308	15.309204	9.060665	567542.804
0	0	9	8	36412	9103	0.012185	39.730392	39.718208	17.413335	8.259239	634054.339
0	0	10	9	40612	10153	0.014453	35.585056	35.570603	17.133777	8.132074	695836.932

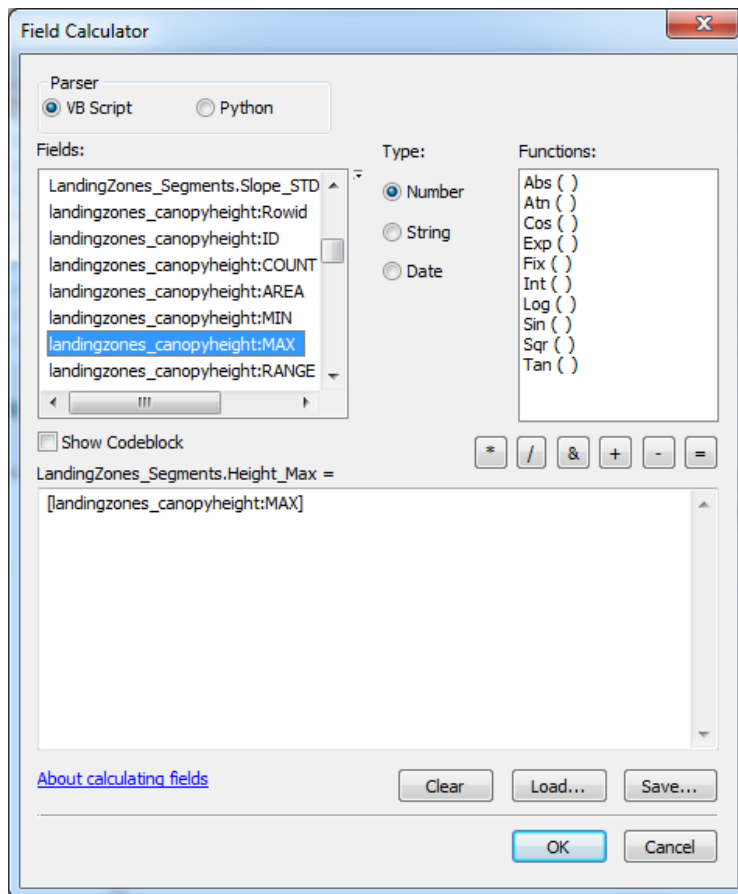
(0 out of 7831 Selected)

LandingZones_Segments

- Note that the leftmost portion of the table isn't shown in the above image, as the table would've been too large to fit on the page. Therefore, you can't see the other empty fields you added.
 - You can change the width of columns by clicking in-between the headers and dragging.
- Repeat steps 2-6 for the **LandingZones_CanopyCover** and **LandingZones_Slope** tables.
 - You should now have a very wide attribute table with two more groups of statistics similar to the above attribute table. Although you can't differentiate between the different joined tables in the attribute table at this point, you will be able to clearly differentiate between them in the next step.

B. Use Field Calculator to Transfer Statistics

- Right click the **Height_Max** column header and select **Field Calculator**.
 - Click **Yes** to close the pop up.
- In the **Field Calculator** window, you will notice that the **Fields** section shows all of the fields, or columns, that are now contained within the attribute table. Unlike the initial table interface, the table names are present here, so you know what raster the statistics are for.
- Scroll down a little bit in the Fields section and double-click **LandingZones_CanopyHeight: Max**.
- Click **OK** (see below).



- i. This populates the Height_Max field with the statistics from the joined table. The reason you are doing it this way is because if you were to export this table with the attached joined table, all of the joined statistical fields would be lost.
5. **Repeat steps 1-4** for the following Height statistics: **Mean** and **Standard Deviation (STD)**. Make sure you are selecting **LandingZones_canopyheight:Mean** and **:Slope** respectively.
 - i. You will need to delete the previous field from the Field Calculator expression before choosing the next statistical field.
 - ii. **Be careful** when you are selecting the fields, as it is easy to choose the wrong one! Double check the syntax before clicking OK.
6. The resulting table should look like the below image once you have transferred the statistics to the new fields.

FID	Shape	ID	Height_Max	HeightMean	Height_STD	Cover_Max	Cover_Mean	Cover_STD	Slope_Max	Slope_Mean	Slope_STD
0	Polygon	0	61.0477	37.9562	14.0453	0	0	0	0	0	0
1	Polygon	1	55.359	29.1266	15.0215	0	0	0	0	0	0
2	Polygon	2	59.7148	34.1403	15.6708	0	0	0	0	0	0
3	Polygon	3	56.4323	32.0946	14.2094	0	0	0	0	0	0
4	Polygon	4	58.985	37.1363	14.0991	0	0	0	0	0	0
5	Polygon	5	54.1422	6.85442	10.4608	0	0	0	0	0	0
6	Polygon	6	57.0272	38.948	10.8671	0	0	0	0	0	0
7	Polygon	7	40.2787	15.3092	9.06067	0	0	0	0	0	0
8	Polygon	8	39.7304	17.4133	8.25924	0	0	0	0	0	0
9	Polygon	9	35.5851	17.1338	8.13207	0	0	0	0	0	0
10	Polygon	10	35.428	4.80999	6.14464	0	0	0	0	0	0

(0 out of 7831 Selected)

7. Repeat steps 1-5 for the remaining 6 **Cover** and **Slope** fields that are currently empty.

8. When you are done transferring the data to the fields you manually added, the table should look similar to the below image.

FID	Shape	ID	Height_Max	HeightMean	Height_STD	Cover_Max	Cover_Mean	Cover_STD	Slope_Max	Slope_Mean	Slope_STD
0	Polygon	0	61.0477	37.9562	14.0453	97	88.2321	11.0243	35.6667	7.60672	4.11259
1	Polygon	1	55.359	29.1266	15.0215	98	86.4884	9.41639	32.4993	13.3776	4.32194
2	Polygon	2	59.7148	34.1403	15.6708	97	88.7679	8.19841	22.571	6.71569	3.49092
3	Polygon	3	56.4323	32.0946	14.2094	97	89.375	7.79889	37.1296	9.41286	4.51484
4	Polygon	4	58.985	37.1363	14.0991	97	89.3529	6.62977	31.8627	10.5991	4.7351
5	Polygon	5	54.1422	6.85442	10.4608	99	44.3542	31.0252	89.363	9.53256	9.74324
6	Polygon	6	57.0272	38.948	10.8671	98	90.58	4.88708	25.6293	11.2605	3.79731
7	Polygon	7	40.2787	15.3092	9.06067	97	77.8144	13.3997	35.132	7.61869	4.80777
8	Polygon	8	39.7304	17.4133	8.25924	91	69.0778	17.081	67.5524	8.57995	7.82376
9	Polygon	9	35.5851	17.1338	8.13207	97	78.3462	22.4023	135.466	11.3118	12.2502
10	Polygon	10	35.428	4.80999	6.14464	80	43.4902	21.2689	107.806	14.1548	15.3189

(0 out of 7831 Selected)

i. Now that you have integrated the values from the zonal statistics outputs with the original eCognition output, you can remove the joined tables and begin editing the shapefile.

C. Remove Joins

1. Click the **Table Options** menu one more time (top left of attribute table), hover over **Joins and Relates**, hover over **Remove Joins** and click **Remove All Joins**.

i. This reverts to the original table, but maintains the columns that you added and populated with values.

Part 5: Eliminate Landing Zones With Old Growth

Now that you have linked the maximum canopy height zonal statistics with your eCognition output, you can easily eliminate those potential landing zones that contain old growth. The threshold height used to represent old growth depends on the National Forest's own definition; in this case, everything above 45.72 meters (150 feet) is considered "old growth."

Note: In this section, you will permanently edit the *LandingZones_Segments* shapefile by deleting all polygons containing "old growth." If you are uncertain about the old growth threshold and you may end up wanting to adjust that threshold later, then you should export the shapefile in its current state so that you can go back to it if needed. To do this, simply right click *LandingZones_Segments* in the TOC, hover your cursor over **Data** and select **Export Data**. Click the folder icon in the Export Data window, navigate to the desired folder location and save the shapefile with a different unique name (e.g. *LandingZones_Segments_backup.shp*).

A. Start Editing Landing Zones

1. Right click anywhere in the upper portion of your ArcMap where the toolbars are.
2. In the long menu that pops up, ensure there is a check mark next to **Editor**.
3. If the **Editor** toolbar (see below) isn't already docked to your workspace, drag in the desired spot next to one of the other toolbars docked to your ArcMap session.



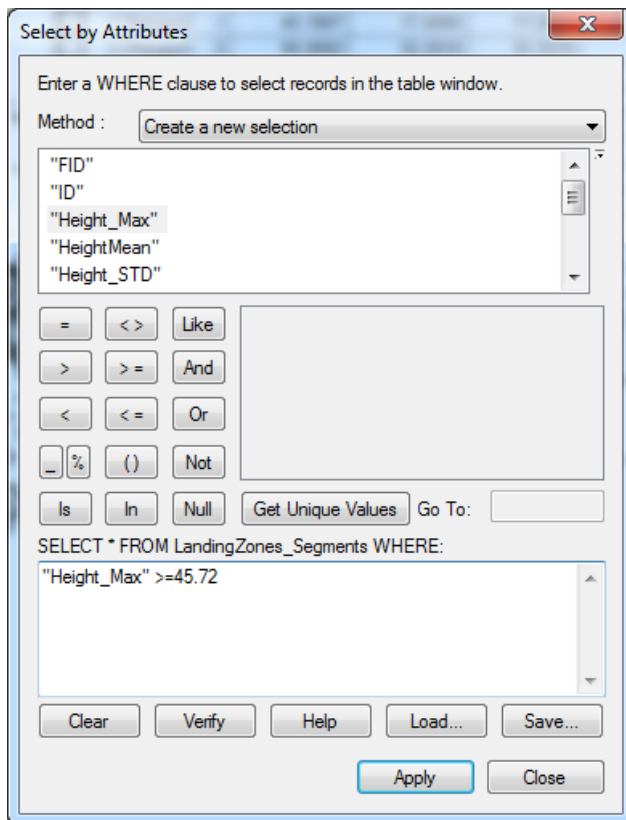
4. Click the **Editor** drop down (see above) and select **Start Editing**.
5. In the Start Editing window that opens up, select **LandingZones_Segments** and click **OK**.

B. Select and Delete Polygons Containing Old Growth

1. If it isn't still open, right-click **LandingZones_Segments** in your TOC and select **Open Attribute Table**.
2. In the LandingZones_Semgnets Attribute Table, click the **Select by Attributes** button (see below).

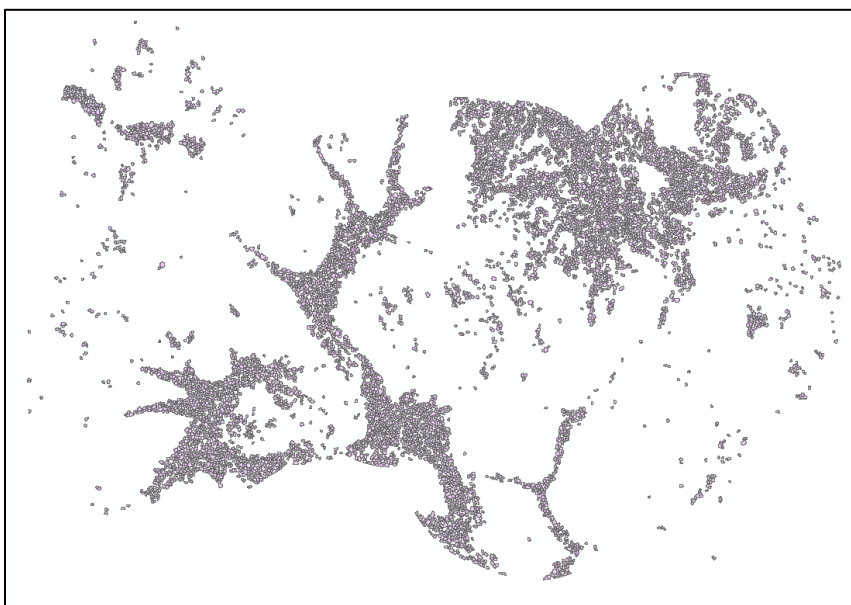


3. Double click "**Height_Max**" and select the '>=' symbol to add them to the equation.
4. After the '>=' symbol, type **45.72**.
 - i. This syntax will select all polygons that contain trees with a max height of greater than or equal to 45.72 meters.
5. Click **Apply** (see below).



6. Next, click the **Delete** key on your keyboard to remove these polygons from the **LandingZones_Shape** shapefile. This will leave you with **4494** polygons (find this count below the attribute table).

- i. Observe the number of PLZs eliminated from contention by comparing the below images (1st=before – 2nd=after).





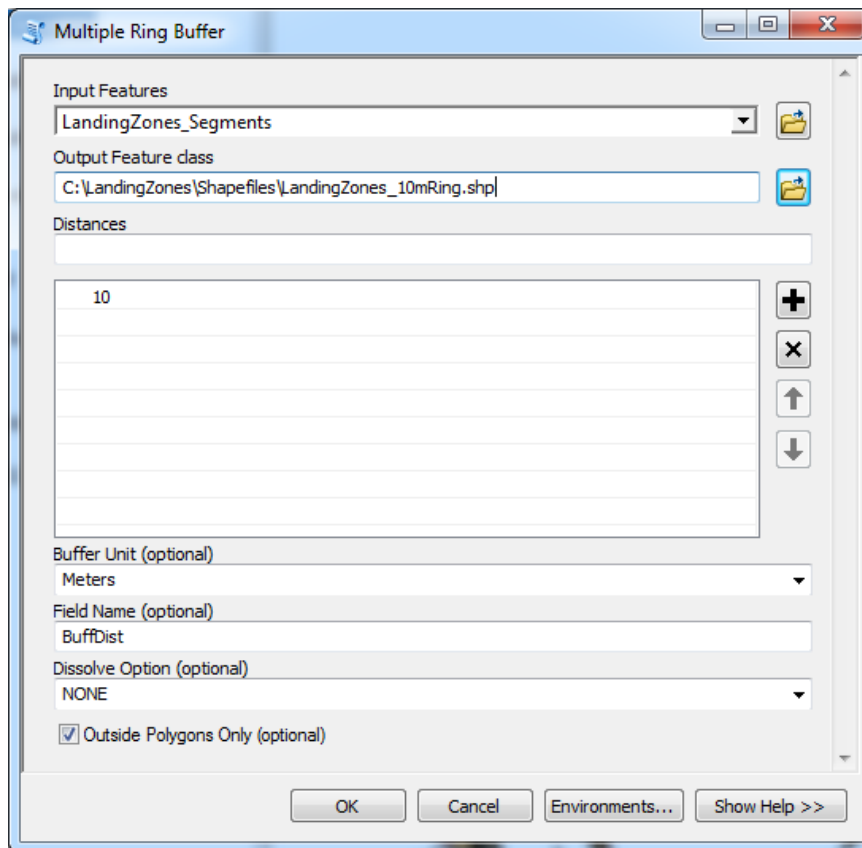
7. Close the **Select By Attributes** window.
8. Click the Editor drop down, click **Save Edits** and then **Stop Editing**.

Part 6: Analyze Area Surrounding PLZs

In order to provide comprehensive information about PLZs, this section focuses on generating canopy height statistics for the area surrounding PLZs. Although you will not be using this data to eliminate any options, it will provide more information to decision makers who are responsible for choosing suitable landing zones.

A. Use Multiple Ring Buffer tool

1. Open the **Multiple Ring Buffer** tool by opening the ArcToolbox and navigating to **Analysis tools, Proximity**.
2. Select **LandingZones_Segments** as the **Input feature**.
3. Click the folder next to Output Feature class and navigate to the **Shapefiles** folder (**C:\LandingZones\Shapefiles**).
4. Name the output file **LandingZones_10mRing.shp** and click **Save**.
5. Enter **10** into the Distances field and change the Buffer Unit to **Meters**.
6. Change the Field name to **BuffDist**.
7. Set the Dissolve Option to **None**.
8. Check the box next to **Outside Polygons Only** and click **OK** to run the tool (see below).



B. Run Zonal Statistics as Table

1. When the Multiple Ring Buffer is done running, right click the output (**LandingZones_10mRing**) and select **Open Attribute Table**.
 - i. If you try to run the zonal statistics table now, you will not be able to use the **ID** field as the **Zone field** within the tool. Instead, it will only allow you to use the **ORIG_FID** field, which has been populated with the values from the **FID** column.

Table

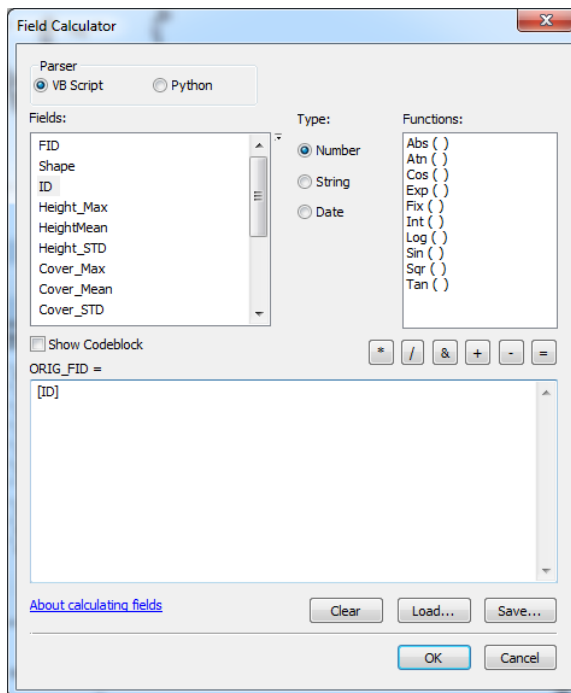
LandingZones_10mRing

	FID	Shape	ID	Height_Max	Height_Mean	Height_STD	Cover_Max	Cover_Mean	Cover_STD	Slope_Max	Slope_Mean	Slope_STD	ORIG_FID	Shape_Leng	Shape_Area	BuffDist
	0	Polygo	7	40.2787	15.3092	9.06067	97	77.8144	13.3997	35.132	7.61869	4.80777	0	0	4980.341388	10
	1	Polygo	8	39.7304	17.4133	8.25924	91	69.0778	17.081	67.5524	8.57995	7.82376	1	0	4779.165186	10
	2	Polygo	9	35.5851	17.1338	8.13207	97	78.3462	22.4023	135.466	11.3118	12.2502	2	0	5044.981767	10
	3	Polygo	10	35.428	4.80999	6.14464	80	43.4902	21.2689	107.806	14.1548	15.3189	3	0	3340.39533	10
	4	Polygo	11	36.5713	11.0678	7.03947	91	69.4487	13.0587	116.128	10.7817	11.9114	4	0	4243.804152	10
	5	Polygo	13	22.6441	4.16244	4.6961	81	39.8475	24.3003	100.136	8.78568	11.8368	5	0	3733.528659	10
	6	Polygo	14	30.7653	3.2874	4.65863	68	30.3846	22.3333	78.6518	9.52286	9.58447	6	0	3714.107094	10
	7	Polygo	15	37.9679	9.09407	11.167	97	48.1064	37.7845	37.244	6.62675	4.65758	7	0	3506.670014	10
	8	Polygo	16	37.6348	5.89626	7.97947	97	42.1417	27.6516	30.4148	5.96367	3.93813	8	0	5547.716021	10
	9	Polygo	17	41.9414	17.9468	7.76552	98	82.6897	9.92073	48.2212	12.2393	5.84506	9	0	3937.281464	10
	10	Polygo	20	44.3867	13.6992	11.4477	92	72.1964	16.5739	40.9068	14.8956	8.10556	10	0	3910.060508	10

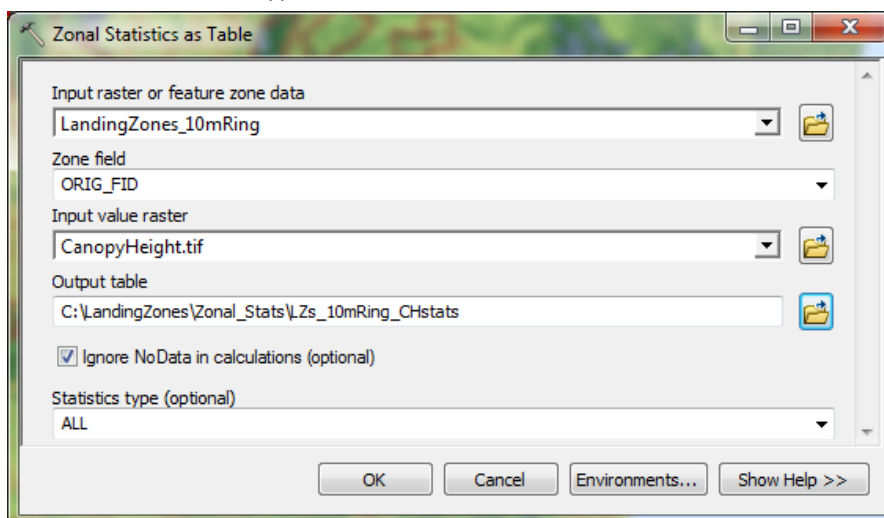
(0 out of 4494 Selected)

LandingZones_10mRing

2. Right-click the **ORIG_FID** column and select **Field Calculator**. Click **Yes** to close the popup.
3. Double-click **ID** in the Fields section of the Field Calculator to add it to the syntax.
4. Click **OK** (see below).



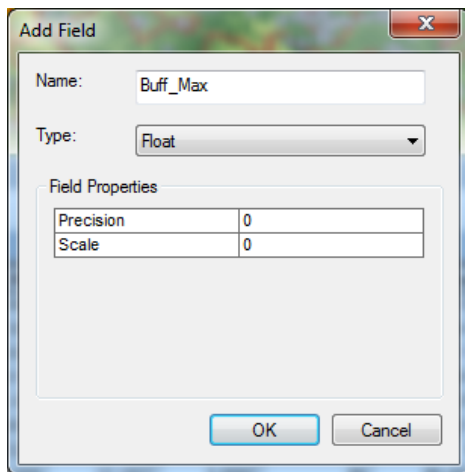
5. Close the **LandingZones_10mRing** attribute table.
6. Open the **Zonal Statistics as Table** tool by opening the ArcToolbox and navigating to **Spatial Analyst Tools, Zonal**.
7. In the **Input raster or feature zone data** field select **LandingZones_10mRing**.
8. Select **Orig_FID** as the **Zone field**.
9. Set the Input value raster to **CanopyHeight.tif**.
10. Click the folder icon next to Output table and navigate to the **Zonal_Stats** folder.
11. Name the output **LZs_10mRing_CHstats** and click **Save**.
 - i. Note that CH is a common acronym for canopy height.
12. Set the Statistics type as **ALL** and click **OK** to run the tool (see below).



13. You can review the table by right clicking it in the TOC and clicking **Open**.
 - i. If desired, you can also generate a table for the canopy cover layer. This would provide you with stats detailing the forest cover within a 10 meter radius around each PLZ.

C. Add Fields To Landing Zones

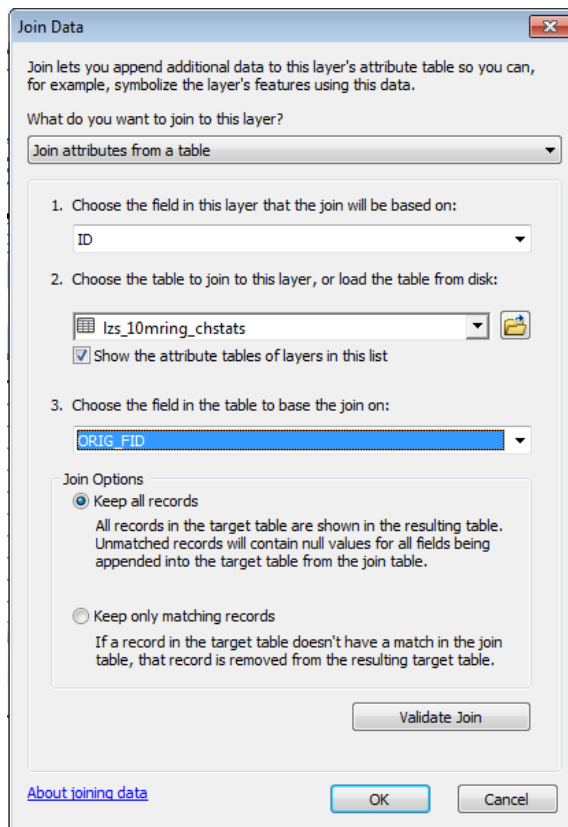
1. Right-click **LandingZones_Segments** and select **Open Attribute Table**.
2. Click the **Table Options** menu at the top left and select **Add Field**.
3. In the Add Field window that opens, type **Buff_Max**, change the **Type** to **Float** and click **OK** (see below).



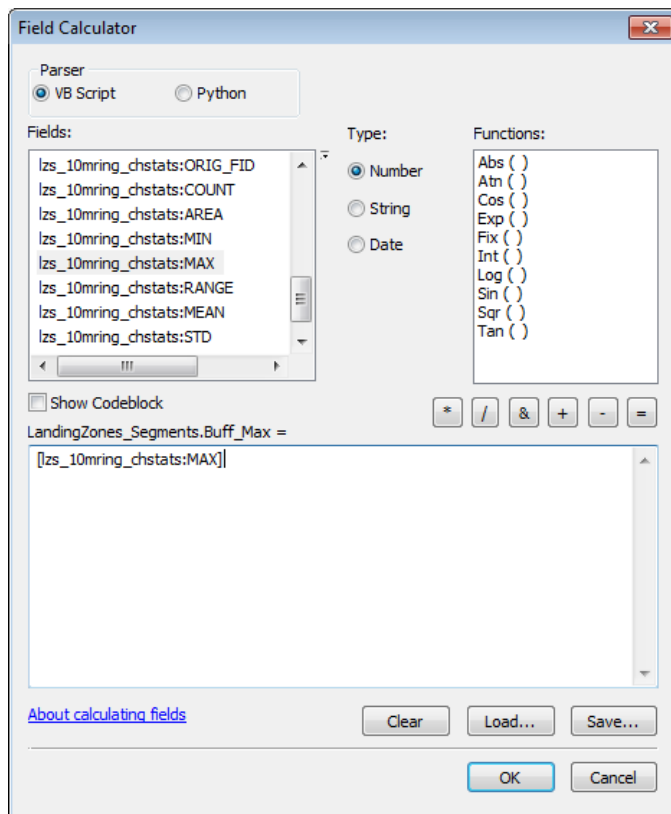
4. Repeat steps 2 and 3 using the following field names: **Buff_Mean** and **Buff_STD**.

D. Join Table to Landing Zones

1. Click the **Table Options** menu, hover over **Joins and Relates** and select **Join**.
2. In the **Join Data** window that opens, click the drop down in section 1 and select **ID**.
3. In section 2, click the drop down and select **LZs_10mRing_CHstats**.
4. Click the drop down in section 3, select **ORIG_FID** and click **OK** (see below).



5. Next, right click **Buff_Max** and select **Field Calculator**.
6. Scroll down in the **Fields** section and double click **lzs_10mring_chstats:max** (see below).



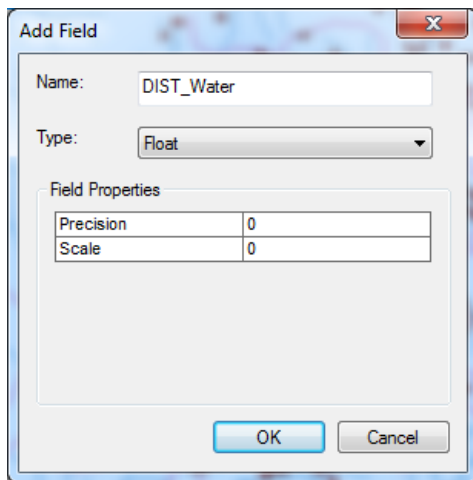
7. Repeat steps 5 and 6 for the fields **Buff_Mean** and **Buff_STD** using their respective field names from the joined table.
8. Once you have populated all three **Buff** fields, click the **Table Options** menu, hover your cursor over **Joins and Relates**, hover over **Remove Joins** and select **lzs_10mring_chstats**.
9. The resulting attribute table should look like the below image.

Part 7: Proximity to NHD

Another aspect of landing zones that decision makers are interested in is the proximity to streams or rivers. Close proximity to a river or stream may rule out a given PLZ from contention in the selection process, so you will generate a basic distance metric that captures the distance between the nearest NHD stream and the PLZs. A caveat of the Near tool, which is what you will use to generate the distance metric, is that you can only run it once on a given shapefile. If you run the tool twice on a single shapefile, the fields added to the table on the first attempt will be overridden. This is important to understand because you will generate near distances for both NHD streams/ rivers and roads. To get around this, you will add a field to the table called DIST_River that you will populate with the distance metrics for rivers and streams.

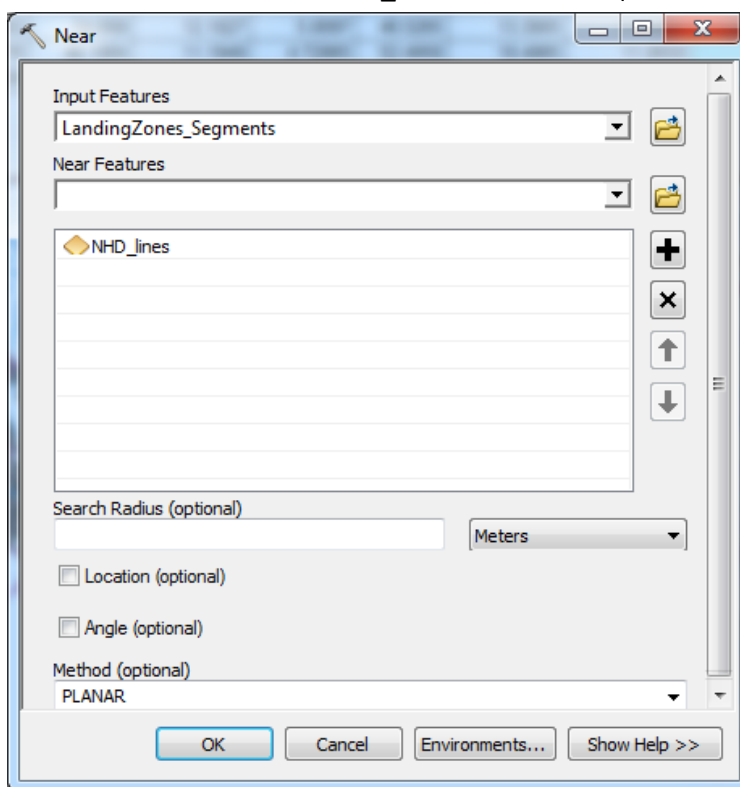
A. Add Field to Attribute Table

1. Right click **LandingZones_Segments** and select **Open Attribute Table**.
2. Click the **Table Options** drop down and select **Add Field**.
3. Change the **Name** to **DIST_Water** and change the **Type** to **Float** (see below).

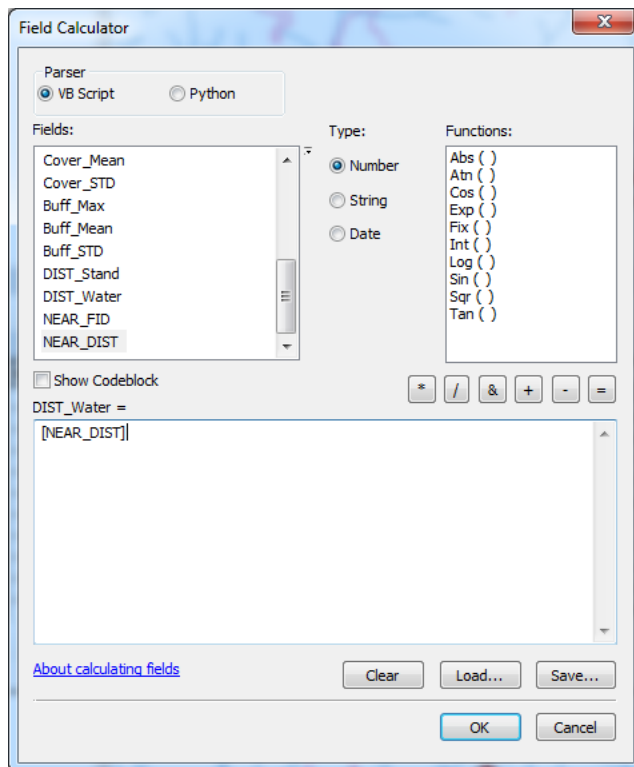


B. Use Near Tool

1. Open the **Near** tool by opening the **ArcToolbox** and navigating to **Analysis Tools, Proximity**.
2. Set the **Input Features** to **LandingZones_Segments**.
3. Set the **Near Features** to **NHD_Lines** and click **OK** (see below).



- i. This adds two new columns to the attribute table called **NEAR_FID** and **NEAR_DIST**.
4. Next, right click the **DIST_Water** column name and select **Field Calculator**. Click **Yes** to close the pop up.
5. In the **Field Calculator** window, delete anything that is currently in the syntax, then double click **NEAR_DIST** at the bottom of the **Fields:** section and click **OK** (see below).



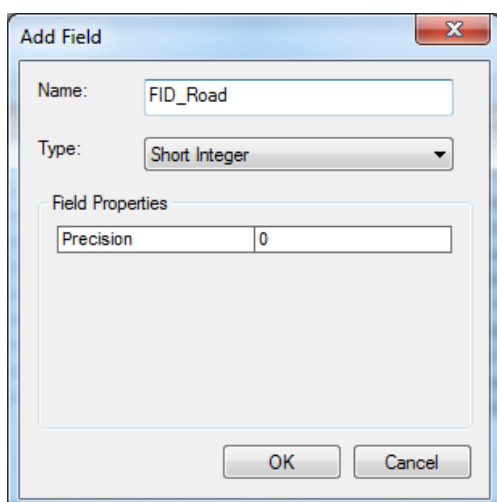
- i. This will populate the DIST_River column with the values from the NEAR_DIST column.
- ii. You can leave the two NEAR columns for now because in the next part you will run the tool again and those fields will be automatically replaced.

Part 8: Proximity to Existing Roads

An ideal landing zone is very close to an existing road because it cuts down on the costs of building new roads to access a landing zone.

A. Add Fields For Distance To Roads

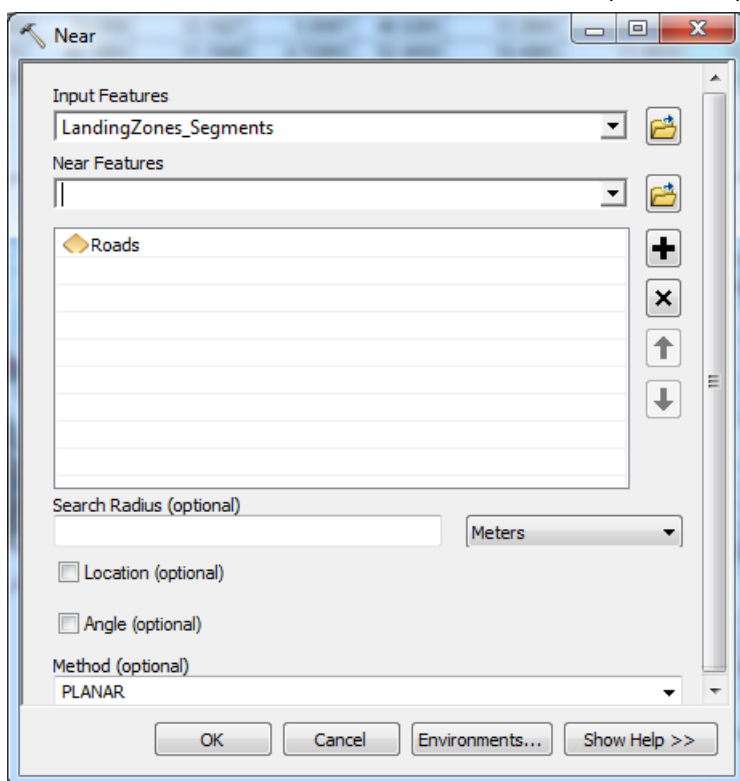
1. Click the **Table Options** drop down menu in the **LandingZones_Segments** attribute table and click **Add Field**.
2. Set the **Name** to **FID_Road**, change the **Type** to **Short Integer** and click **OK** (see below).
 - i. The FID won't contain decimals, so you do not need to set the Type to Float.



3. Repeat steps 1 and 2, but name the new field **DIST_Road** and set the **Type** to **Float**.

B. Use Near Tool

1. Open the **Near** tool by opening the **ArcToolbox** and navigating to **Analysis Tools, Proximity**.
2. Select **LandingZones_Segments** as the Input Feature.
3. Select **Roads** as the **Near Features** and click **OK** (see below).



4. Next, right-click the **FID_Road** field and select **Field Calculator**.
5. In the **Fields** column, double-click **Near_FID**, which is towards the bottom of the list.
6. Click **OK** (see below).



Field Calculator

Parser
☒ VB Script ☐ Python

Fields:
 Slope_STD
 Buff_Max
 Buff_Mean
 Buff_STD
 DIST_Water
 FID_Road
 DIST_Road
 NEAR_FID
 NEAR_DIST

Type:
☒ Number
☐ String
☐ Date

Functions:
 Abs ()
 Atn ()
 Cos ()
 Exp ()
 Fix ()
 Int ()
 Log ()
 Sin ()
 Sqr ()
 Tan ()

☐ Show Codeblock

FID_Road =
 [NEAR_FID]

[About calculating fields](#)

Clear Load... Save... OK Cancel

- Repeat steps 4-7 for the **DIST_Road** field, selecting the **NEAR_DIST** field in the Field Calculator.
- Right-click the **NEAR_FID** column and select **Delete Field**. Click **Yes** when prompted.
- Repeat this for the **NEAR_DIST** column.
- The resultant table should look similar to the below image.

FID	Shape	ID	Height_Max	HeightMean	Height_STD	Cover_Max	Cover_Mean	Cover_STD	Slope_Max	Slope_Mean	Slope_STD	Buff_Max	Buff_Mean	Buff_STD	DIST_Water	FID_Road	DIST_Road
0	Polygon	7	40.2787	15.3092	9.06067	97	77.8144	13.3997	35.132	7.61869	4.80777	38.9341	14.5777	9.30821	31.5658	55	457.58
1	Polygon	8	39.7304	17.4133	8.25924	91	69.0778	17.081	67.5524	8.57995	7.82376	40.2787	10.0327	8.80862	0	55	342.834
2	Polygon	9	35.5851	17.1338	8.13207	97	78.3462	22.4023	135.466	11.3118	12.2502	36.9792	13.9604	9.78353	0	65	400.796
3	Polygon	10	35.428	4.80999	6.14464	80	43.4902	21.2689	107.806	14.1548	15.3189	33.8217	8.51917	7.36179	0	55	338.049
4	Polygon	11	36.5713	11.0678	7.03947	91	69.4487	13.0587	116.128	10.7817	11.9114	29.1566	9.83444	6.74919	0	65	302.261
5	Polygon	13	22.8441	4.16244	4.6961	81	39.8475	24.3003	100.136	8.78568	11.8368	26.6281	4.66077	5.51787	1.08084	65	322.934
6	Polygon	14	30.7653	3.2874	4.65663	68	30.3846	22.3333	78.6518	9.52286	9.58447	22.4154	2.01788	3.71707	0	65	377.144
7	Polygon	15	37.9679	9.09407	11.167	97	48.1064	37.7845	37.244	6.62675	4.65758	37.6348	12.6569	11.5035	0	65	173.83
8	Polygon	16	37.6348	5.89626	7.97947	97	42.1417	27.6516	30.4148	5.96367	3.93813	37.9679	9.16732	10.1232	0	65	177.037
9	Polygon	17	41.9414	17.9468	7.76552	98	82.6897	9.92073	48.2212	12.2393	5.84506	39.8778	19.4451	6.69559	0	65	19.1345
10	Polygon	20	44.3867	13.6992	11.4477	92	72.1964	16.5739	40.9068	14.8956	8.10556	44.5576	15.5576	11.9695	70.8312	144	172.884

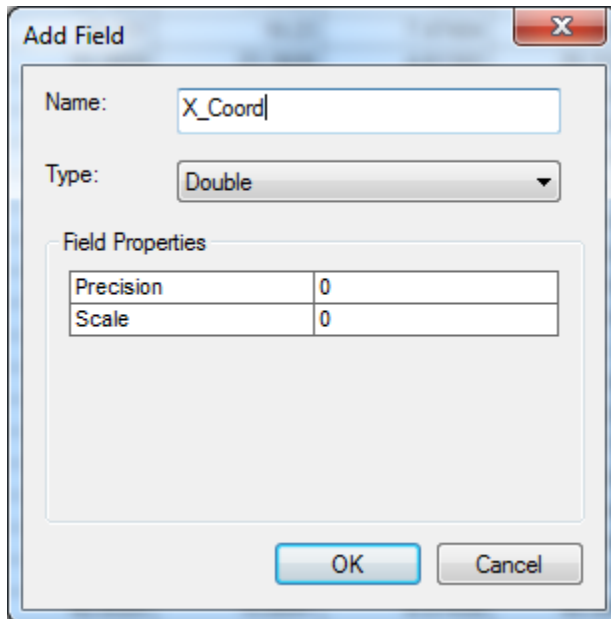
Part 9: Add X, Y Coordinates and Area Stats

The final fields to add to the attribute table are ones for the X and Y coordinates, which will be communicated in decimal degrees. With the coordinates added to the table, users will be able to print out a spreadsheet that contains some of the PLZs most likely to be suitable



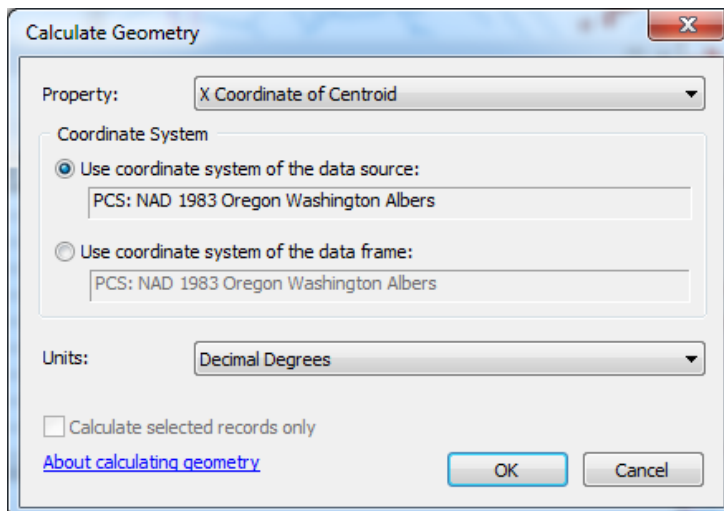
A. Add New Field to Attribute Table

1. Open the **LandingZones_Segments** attribute table if it isn't still open.
2. Once again, click the **Table Options** menu in the top left of the attribute table and select **Add Field**.
3. Set the name to **X_Coord**, change the **Type** to **Double** and click **OK** (see below).
 - i. Note that you will not be allowed to type in X_Coordinate because there is a limit of 10 characters for a field name.



The 'Add Field' dialog box is shown. The 'Name' field contains 'X_Coord'. The 'Type' dropdown is set to 'Double'. Under 'Field Properties', there are two input fields: 'Precision' and 'Scale', both set to '0'. At the bottom are 'OK' and 'Cancel' buttons.

4. Right click **X_Coord** in the attribute table and select **Calculate Geometry**.
5. Click **Yes** to close the pop up.
6. In the **Calculate Geometry** window, change the **Property** to **X Coordinate of Centroid**.
7. Change the **Units** to **Decimal Degrees** and click **OK** (see below). Click **Yes** to close the pop up.



The 'Calculate Geometry' dialog box is shown. The 'Property' dropdown is set to 'X Coordinate of Centroid'. Under 'Coordinate System', the 'Use coordinate system of the data source' radio button is selected, and the text box below it contains 'PCS: NAD 1983 Oregon Washington Albers'. The 'Units' dropdown is set to 'Decimal Degrees'. There is a checkbox for 'Calculate selected records only' which is unchecked. At the bottom are 'OK' and 'Cancel' buttons, and a link for 'About calculating geometry'.

8. Repeat steps 2-7 using the field name **Y_Coord** and the **Property: Y Coordinate of Centroid**.

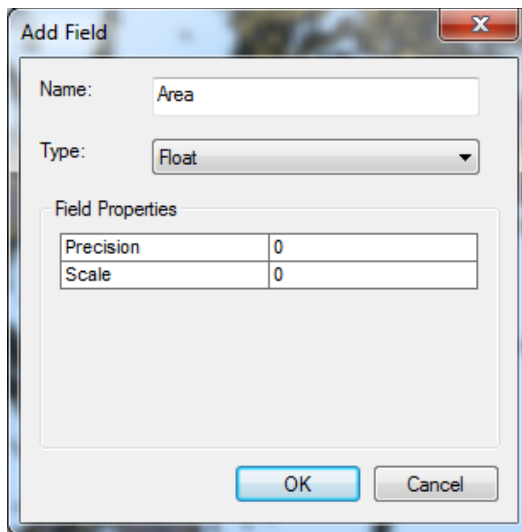
9. The two new fields should look like the below image.

X_Coord	Y_Coord
-122.027809	45.828484
-122.026558	45.828811
-122.031125	45.828979
-122.026459	45.829554
-122.03275	45.829332
-122.031879	45.829694
-122.030959	45.829756
-122.036696	45.828106
-122.035952	45.828666
-122.037735	45.82979
-121.985931	45.830065

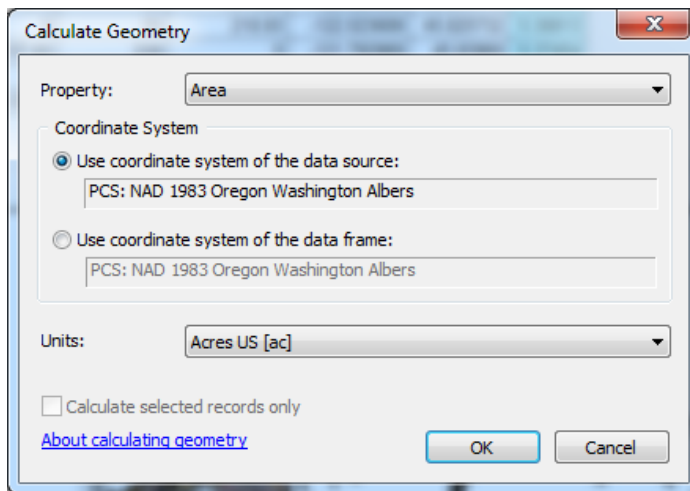
i. These fields can be used to locate the center of each PLZ.

B. Add New Field to Attribute Table

1. Next, click the **Table Options** drop down menu and select **Add Field**.
2. Type **Area** into the Name field and set the **Type** to **Float**.
3. Click **OK** (see below).



4. Next, right click the **Area** column in the attribute table and select **Calculate Geometry**.
5. Set the **Property** to **Area** and change the **Units** to **Acres US [ac]**.
6. Click **OK** (see below). Click **Yes** to close the pop up.



7. **Save** your ArcMap session by clicking the **Save** button in the top left of your ArcMap.

Congratulations! You have successfully completed this exercise. You now know how to generate a suite of statistics relating to each PLZ that can be utilized by decision makers to choose the most suitable landing zone for a given logging stand.