ArcGIS Point Analysis

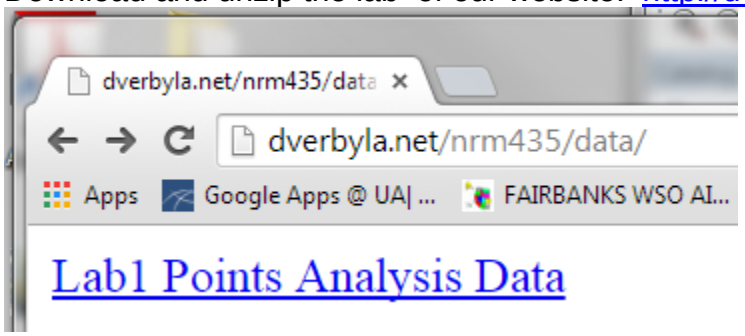
ET, the extraterrestrial has been seen in the Tanana Valley. Researchers believe that ET's preferred habitat is willow shrub polygons. Vegetation polygons with type values of 62,67,70,71 are willow polygons.

Your job is to use the point analysis capabilities of GIS to test this hypothesis.

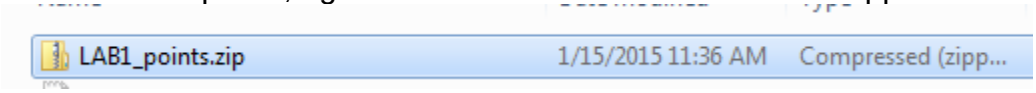
You will use ArcGIS to answer four questions:

1) Does the home range have a higher percentage of willow area than the entire area? **(YES)**
2) Within ET's home range , are there more ET location points within willow polygons compared to random points? **(YES)**
3) Is mean distance of the ET location points closer to willow polygon boundaries compared to random points? **(YES)**
4) Are there more ET than random locations within 100 meters of a willow? **(YES)**

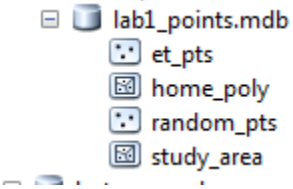
Download and unzip the lab of our website: http://dverbyla.net/nrm435/data

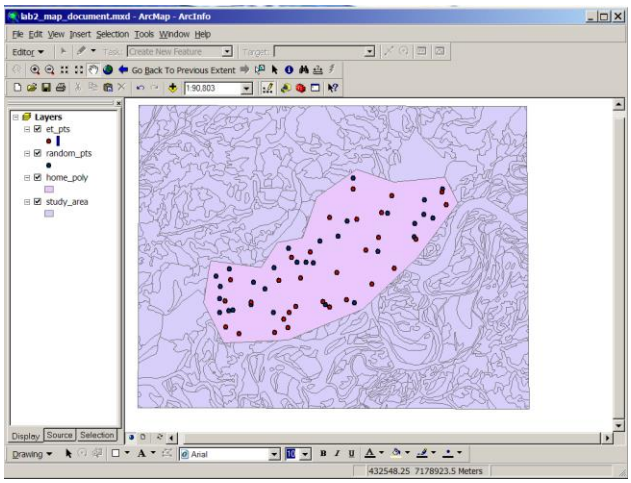


In windows explorer, right mouse click and extract from the zipped file:



Start arcmap and add the GIS feature classes to your data frame.

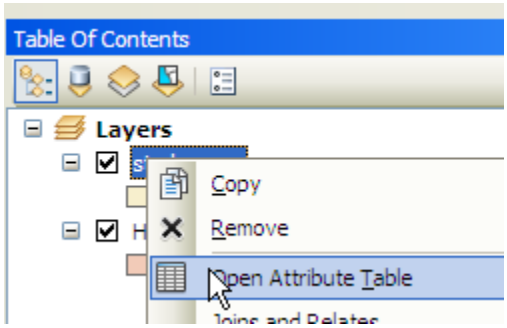


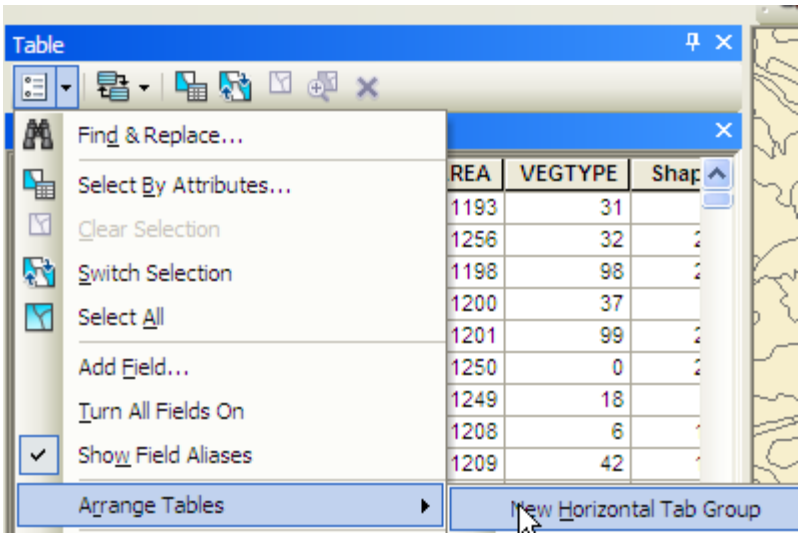


1) **Does the home range have a higher percentage of willow (willow is type 62,67,70 or 71) area than the entire area?**

First use the **Clip** geoprocessing tool to clip out all the study area vegetation polygons inside home-poly.. Name your output theme ***home_veg*** and store it in your personal geodatabase.

Next we will compute the area in willow and total area (hectares) for these two themes (***home_veg*** and ***study_area***). Open the polygon attribute tables from these two feature classes.





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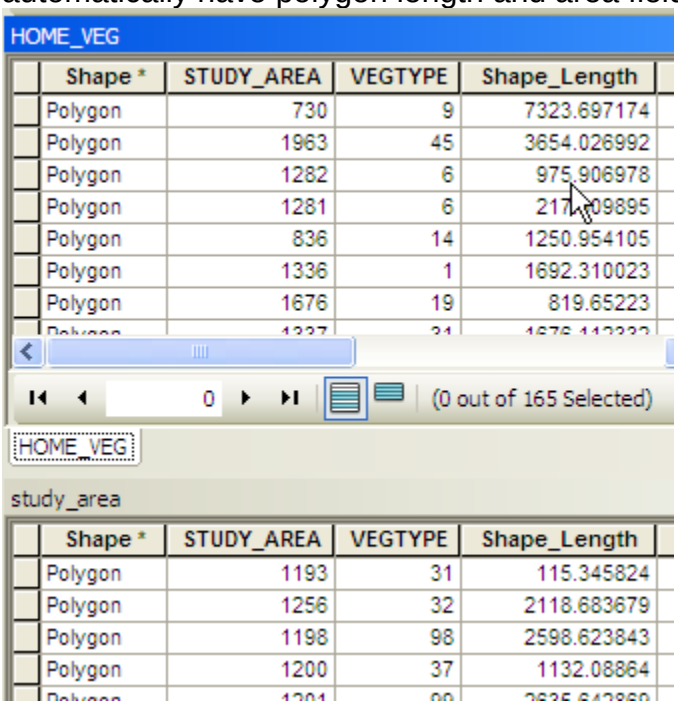
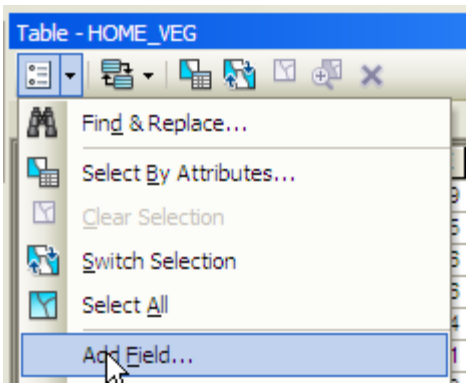
Notice that new polygon features in a personal geodatabase feature class automatically have polygon length and area fields.

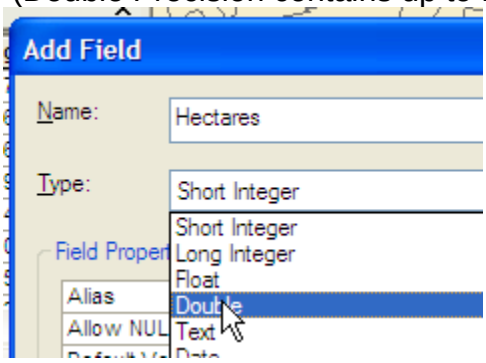


These field values are in meters because our geodatabase feature class coordinate system is in meters…

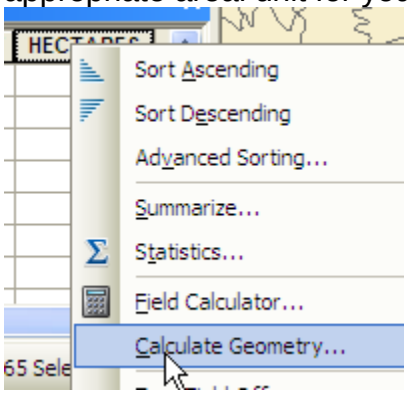
Add a Double Precision field to each table called Hectares



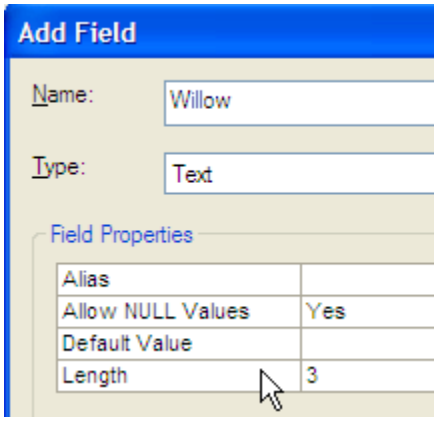
(Double Precision contains up to 13 significant digits, so it is very precise)

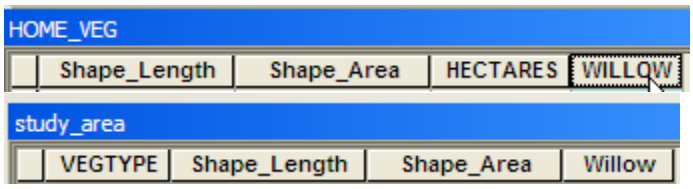


Next, calculate Hectares by selecting ***Calculate Geometry***…and selecting the appropriate areal unit for your Hectares field.

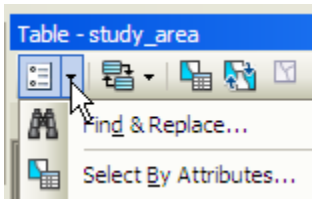


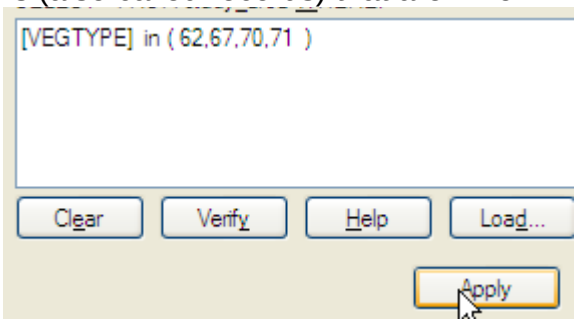
Next we will flag the polygon records that represent willow polygons. First, add a three-character text field named ***Willow*** to each table.



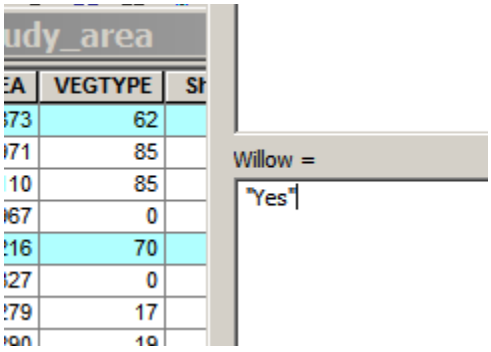


Then select all table rows (also called records) that are willow

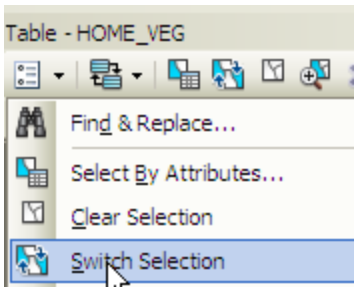




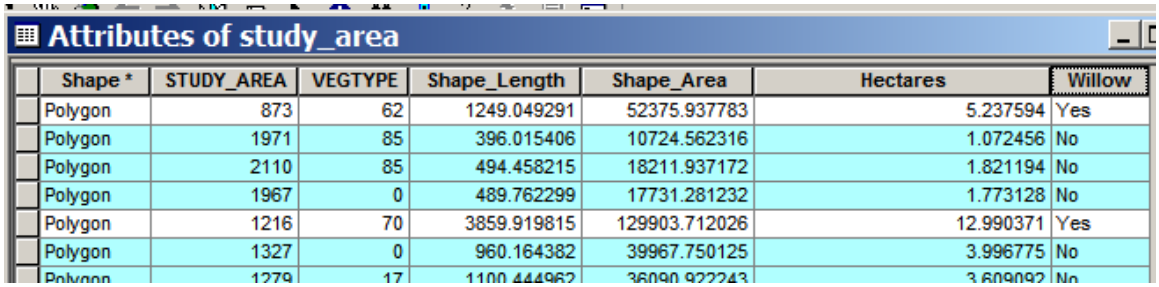
and calculate the Willow field for these selected rows to be “Yes”



Then switch selection

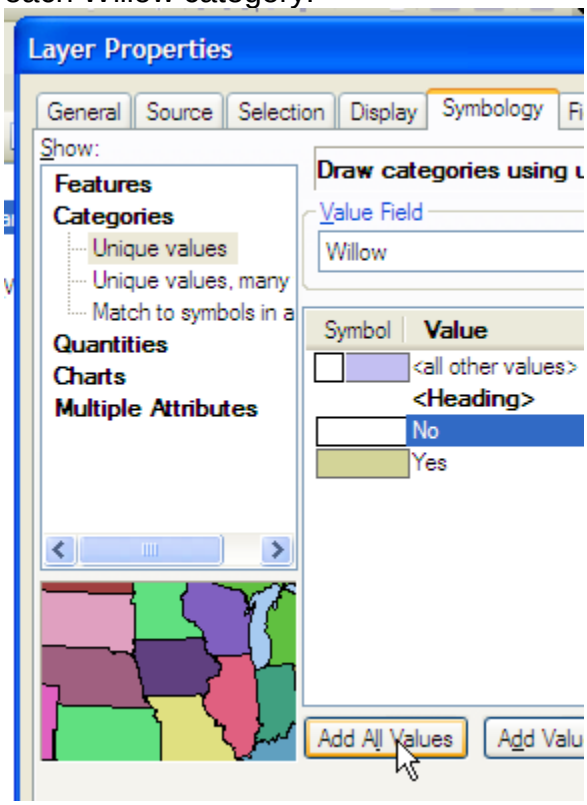


and calculate the Willow field for these rows to be “No”

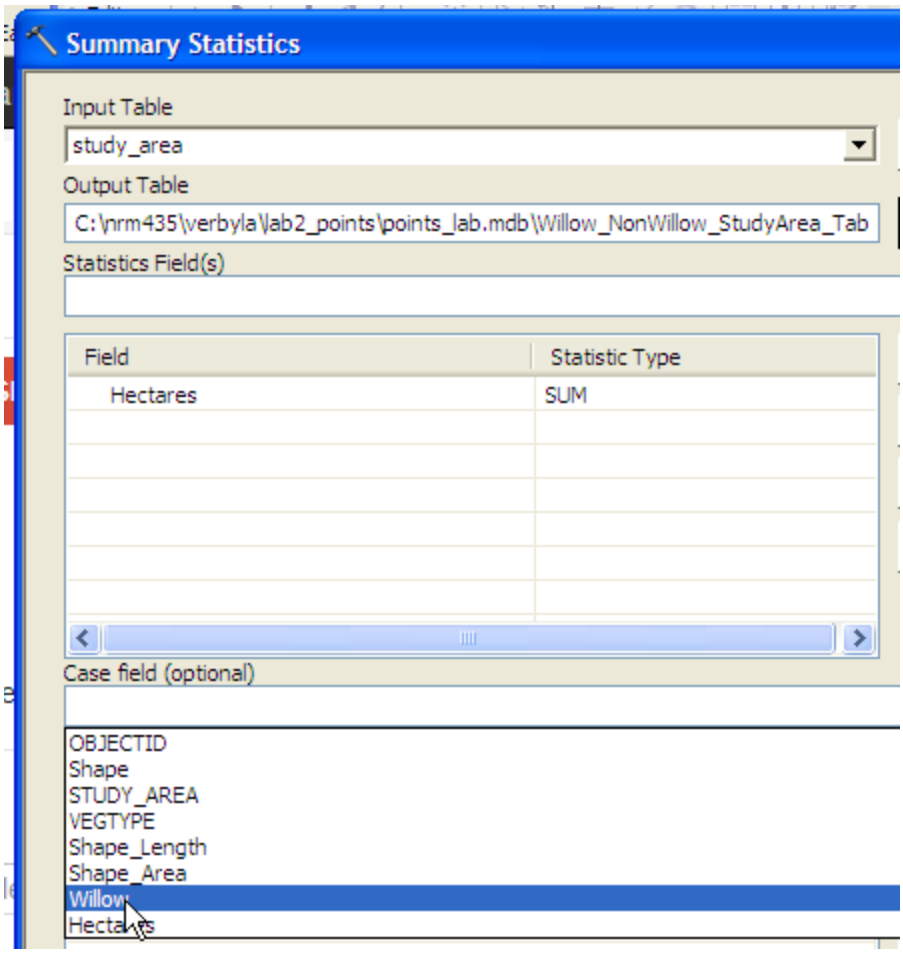


Shape *	STUDY_AREA	VEGTYPE	Shape_Length	Shape_Area	Hectares	Willow
Polygon	873	62	1249.049291	52375.937783	5.237594	Yes
Polygon	1971	85	396.015406	10724.562316	1.072456	No
Polygon	2110	85	494.458215	18211.937172	1.821194	No
Polygon	1967	0	489.762299	17731.281232	1.773128	No
Polygon	1216	70	3859.919815	129903.712026	12.990371	Yes
Polygon	1327	0	960.164382	39967.750125	3.996775	No
Polygon	1279	17	1100.444962	36090.922243	3.609092	No

So at this point your ***study_area*** and ***home_veg*** polygon tables have a Willow field with values of “Yes” or “No”. Display these layers by using this field to color each Willow category.



Then use the **Summary Statistics** geoprocessing tool to determine the total area in Hectares in willow versus not in willow for both polygon themes (***case field Willow*** will output for each different willow value)



This tool will then compute the sum of Hectares for each different value in the Willow field and output to a table in the geodatabase named *Willow_NonWillow_StudyArea_Table*

Willow_NonWillow_StudyArea_Table

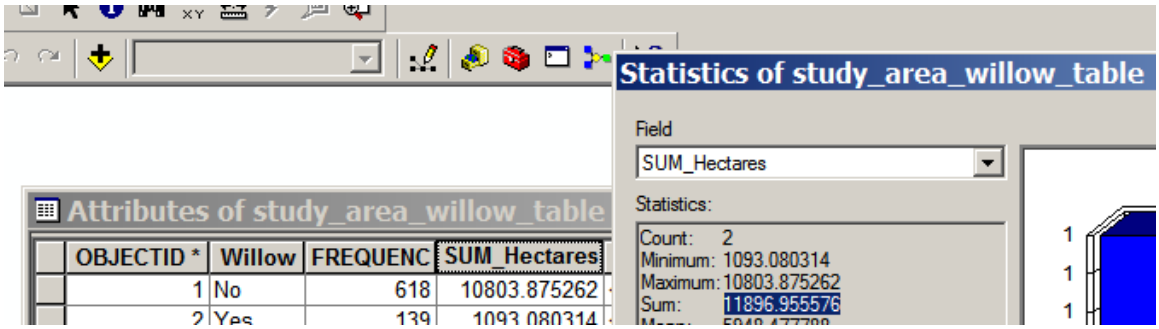
	Willow	FREQUENCY	SUM_Hectares
	No	618	10803.875262
	Yes	139	1093.080314

Repeat the analysis for you home veg polygons.

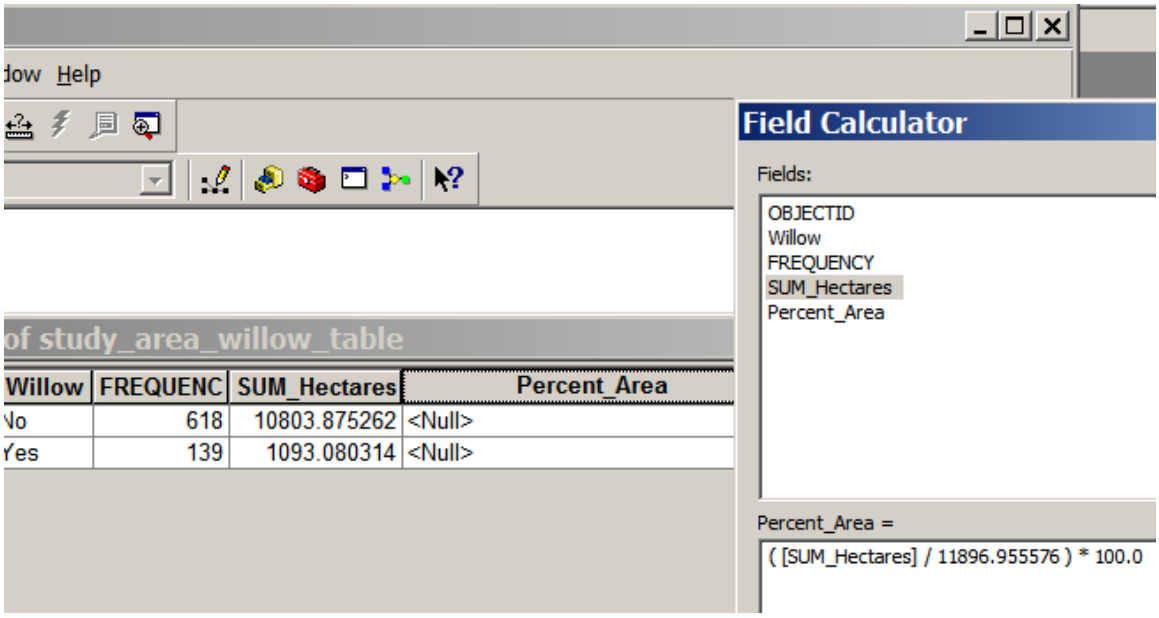
We really want to know what is the *percentage of willow* within each of the 2 feature classes (Home_Veg versus Study_Area)…

Add a double precision field named *Percent_Area* in each table.

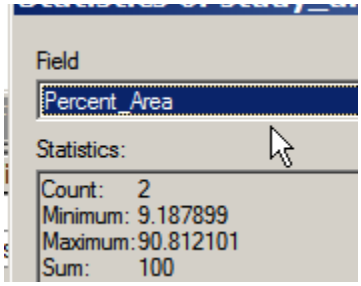
Then use field statistics to determine the total area and then compute the percent area in each table. For example,

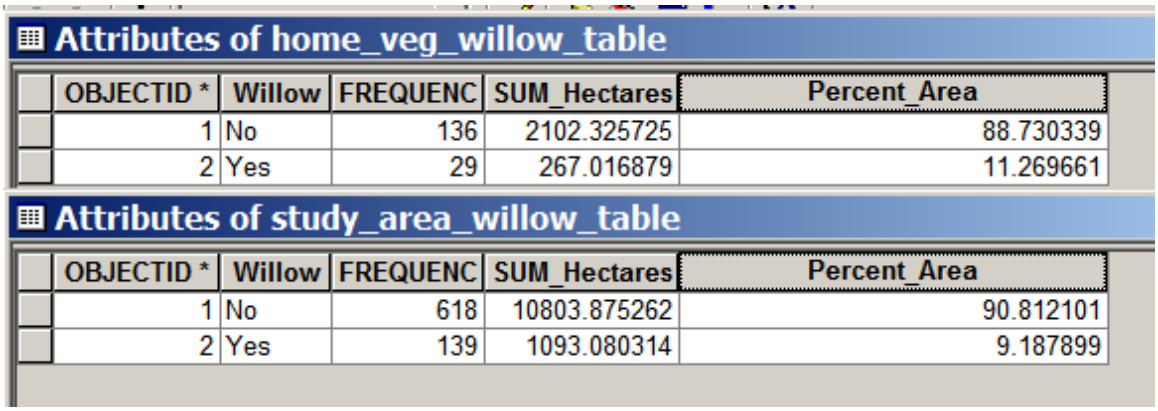


So the total area of polygons in your study area is 11896.955576 hectares…then use the field calculator…



Use field statistics to **check that your Percent_Area adds up to 100 percent**:





Attributes of home_veg_willow_table

OBJECTID *	Willow	FREQUENC	SUM_Hectares	Percent_Area
1	No	136	2102.325725	88.730339
2	Yes	29	267.016879	11.269661

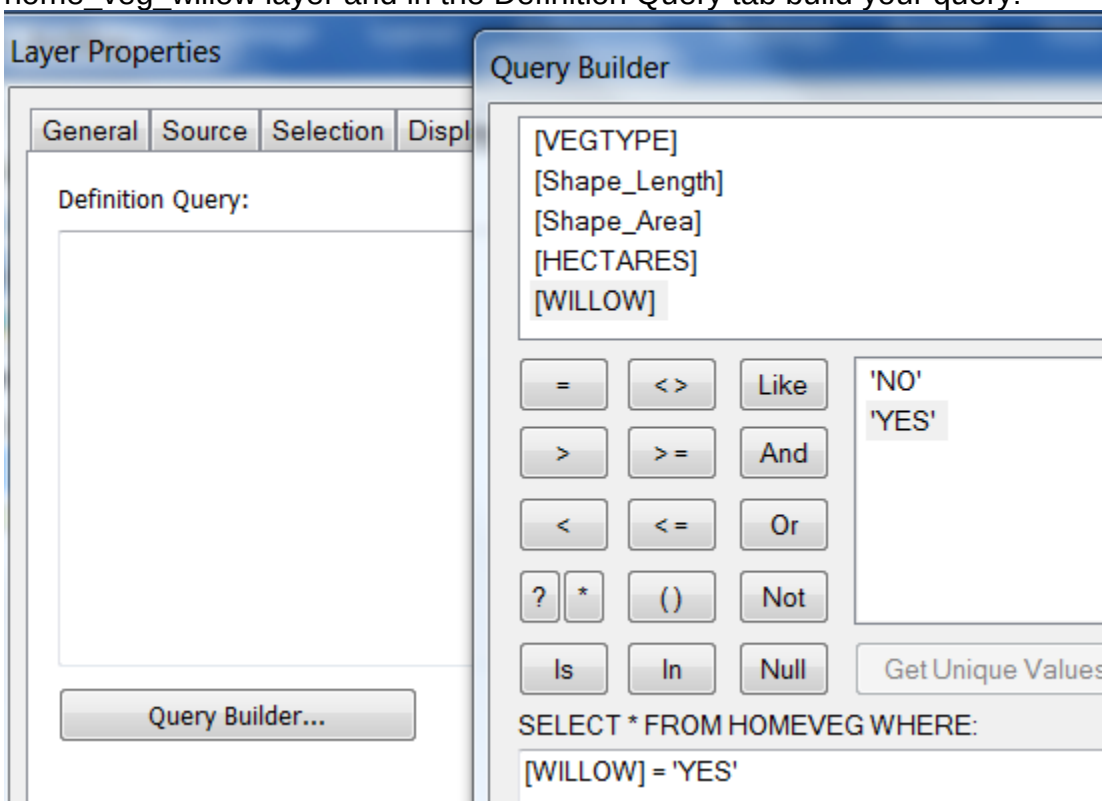
Attributes of study_area_willow_table

OBJECTID *	Willow	FREQUENC	SUM_Hectares	Percent_Area
1	No	618	10803.875262	90.812101
2	Yes	139	1093.080314	9.187899

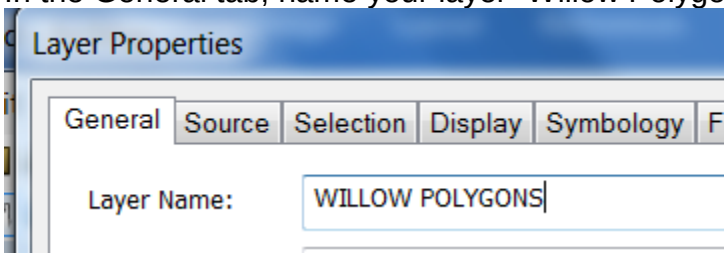
So there is more percent willow in ET's home range (11.3 percent) compared to the entire study area (9.2 percent).

2) Within ET's home range, are there more ET location points within willow polygons compared to points randomly located within ET's home range?

First create a layer of willow polygons, by right mouse clicking on your home_veg_willow layer and in the Definition Query tab build your query:



In the General tab, name your layer "Willow Polygons"



VEGTYPE	Shape_Length	Shape_Area	HECTARES	WILLOW
71	2129.528656	95222.718354	9.522272	YES
71	4231.273371	401954.040636	40.195404	YES
67	2028.579435	50983.348389	5.098335	YES
67	989.197833	32192.624805	3.219262	YES
67	1448.648796	80541.327025	8.054133	YES
71	770.904601	33860.681154	3.386068	YES
70	2145.310776	92242.157025	9.224216	YES
70	888.100621	18717.889907	1.871789	YES
67	4200.405226	303380.345194	30.338035	YES
67	818.048484	29740.999671	2.9741	YES
67	1359.922772	61813.883534	6.181388	YES
62	1464.520645	55518.932699	5.551893	YES
67	3608.227873	130299.499105	13.02995	YES
67	916.23081	32858.077284	3.285808	YES

(0 out of 29 Selected)

You should have 29 willow polygons

Next create output themes of ET and random points inside willow polygons by using the ***Intersect tool***.

Attributes of ET_in_Willow

Shape *	ET_PTS_ID	STUDY_AREA	VEGTYPE	Hectares
Point	3	1563	67	11.626216
Point	6	1481	67	8.6003
Point	24	1341	71	40.195404
Point	13	1341	71	40.195404
Point	14	830	67	17.981136

Attributes of RanPts_in_Willow

Shape *	RANDOM_PTS	STUDY_AREA	VEGTYPE	Hectares
Point	10	1341	71	40.195404
Point	13	830	67	17.981136

So there were 5 ET points in willow and only 2 random points….

3) Is mean distance of the ET location points closer to willow polygon boundaries than the mean distance for randomly located points?

You can use the ***Near tool*** to find the distance from each point to the nearest willow polygon. The output from the ***Near tool*** will be a new field in your points table that represents distance. Notice that the points with a distance of zero are sitting inside a willow polygon.

Shape *	ET_PTS_ID	NEAR_FID	NEAR_DIST
Point	1	162	63.415547
Point	2	162	104.342451
Point	3	152	0
Point	4	152	61.2[illegible]2
Point	5	161	80.038782

Use your **Summary Statistics** tool to determine the mean distance from points to the nearest willow.

Attributes of ET_willow_mean_distance_table

OBJECTID *	FREQUENCY	MEAN_NEAR_DIST
1	30	332.399339

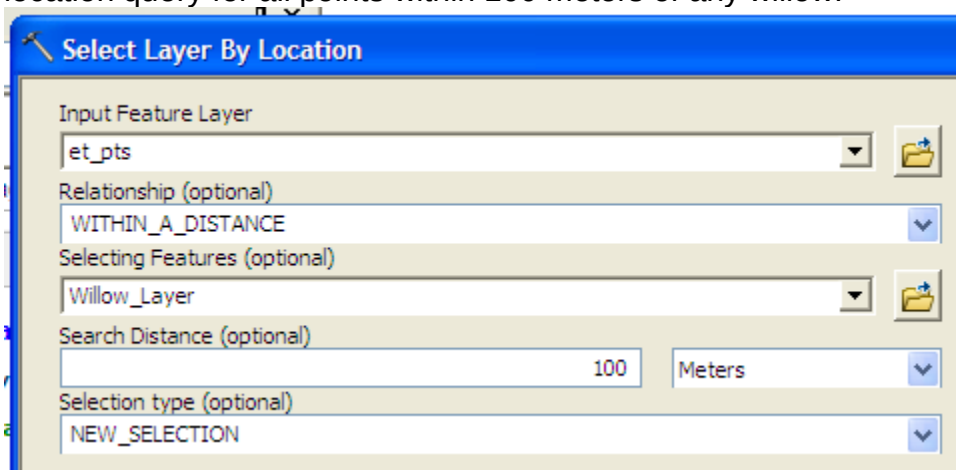
Attributes of Random_points_willow_mean_distance_table

OBJECTID *	FREQUENCY	MEAN_NEAR_DIST
1	30	552.481722

So the mean distance to the nearest willow was 332 meters for ET locations, 552 meters for randomly located points…

4) Are there more ET than random locations within 100 meters of a willow?

Because of positional error in the GIS themes, a point location that is really inside willow may be represented as being slightly outside willow. Do a select by location query for all points within 100 meters of any willow.



So there were 8 ET points within 100 meters of a willow polygon,
7 random points within 100 meters of a willow polygon.