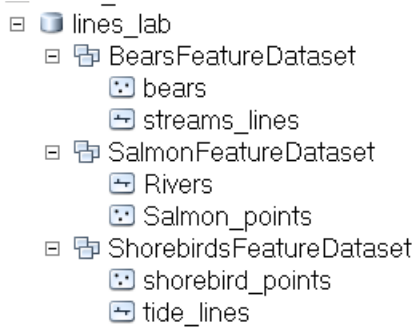
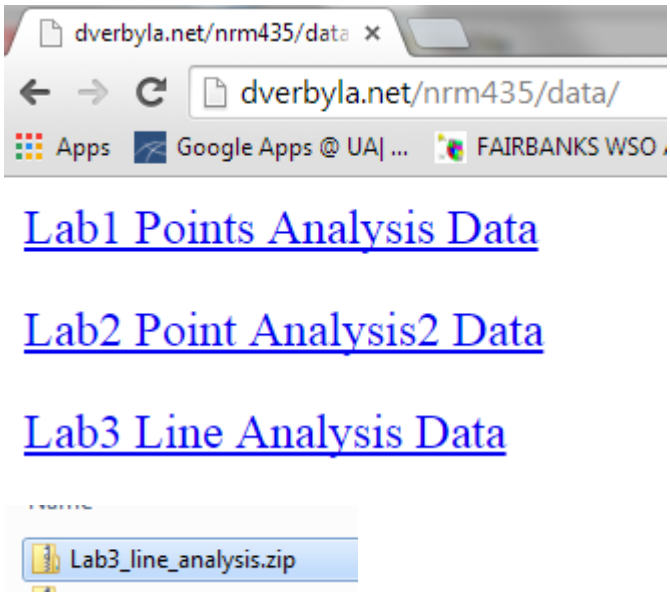
Line Spatial Analysis

In this lab, you will answer questions about points and lines using three feature datasets that are containers stored in a geodatabase.

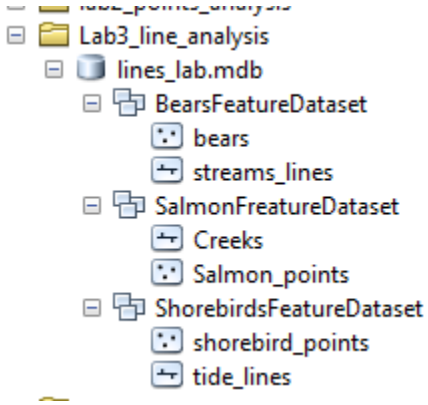


Download the zipped file from

http://dverbyla.net/nrm435/data/



Unzip to your c: drive… connect to the folder in your arcmap catalog window:

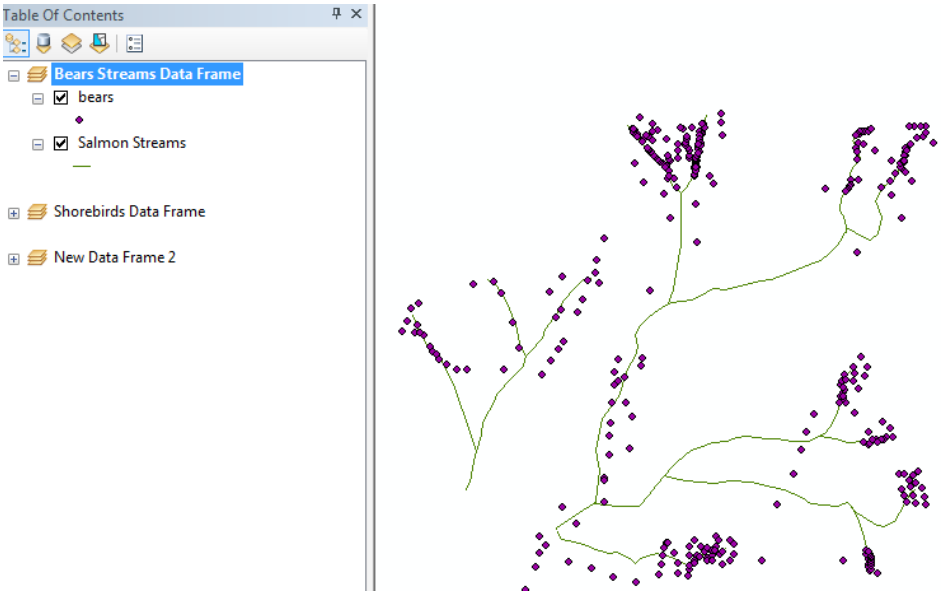


Bears Feature Dataset

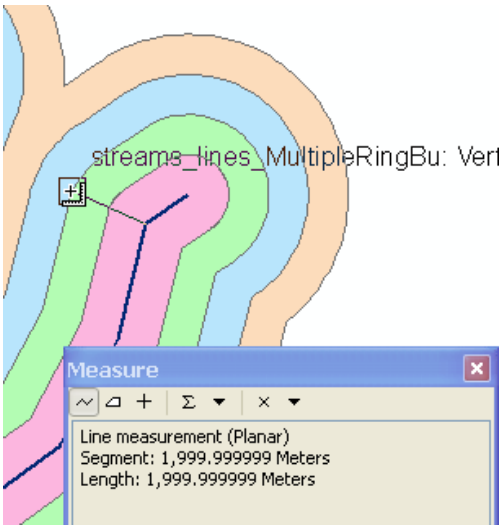
For each individual bear , we want to create a table of the density and number of bear locations in four distance classes from salmon streams.

We expect a higher frequency and density per km^2 for each bear in the class within 1km of a salmon stream…and a lower density for the greater distance classes.

The streams theme has an attribute called ***type*** (**1=salmon stream**, 2=non-salmon stream). Use a definition query on your line layer to create a layer representing salmon streams:



Next use the ***Multiple Ring Buffer*** geoprocessing tool to create dissolved buffer polygons within 1km ,2km,3km and 4km of each salmon stream. Since the X,Y coordinates are in meters, specify your buffer distances as 1000,2000,3000, and 4000. Use your Measure tool to visually check the results..



Add a double precision field named Hectares and for each buffer polygon compute the area in hectares.

SALMON_STREAM_BUFFERS

Shape *	BUFF_DIST_	Buffer_Hectares
Polygon	1000	86,339.5
Polygon	2000	85,766.2
Polygon	3000	84,900.3
Polygon	4000	81,500.2

Next, for each bear location determine the buffer polygon the bear is sitting in. You can do this using the ***Intersect*** geoprocessing tool.

IntersectOutput

Shape *	FID_bears	BEARS_ID	SEX	FID_stream	distance	Hectares
Point	128	9	M	4	4000	81500.157388
Point	138	9	M	2	2000	85766.233325
Point	129	9	M	4	4000	81500.157388
Point	221	23	F	2	2000	85766.233325

Add a text field named Class and use the field calculator to create a name for each Class.

distance	Class
4000	3 to 4 km from a Salmon Stream
2000	1 to 2 km from a Salmon Stream
4000	3 to 4 km from a Salmon Stream
2000	1 to 2 km from a Salmon Stream
3000	2 to 3 km from a Salmon Stream
1000	Within 1km of Salmon Stream
1000	Within 1km of Salmon Stream

Use the ***Summary Statistics*** geoprocessing tool to create a table summarizing by each BearID and distance Class the total number of bears and the buffer polygon area…min and max hectares should be the same!

BEARS_ID	Class	distance	FREQUENCY	MIN_Hectar	MAX_Hectar
7	1 to 2 km from a Salmon Stream	2000	8	85766.233325	85766.233325
7	2 to 3 km from a Salmon Stream	3000	12	84900.310229	84900.310229
7	3 to 4 km from a Salmon Stream	4000	13	81500.157388	81500.157388
7	Within 1km of Salmon Stream	1000	15	86339.509315	86339.509315
8	1 to 2 km from a Salmon Stream	2000	10	85766.233325	85766.233325
8	2 to 3 km from a Salmon Stream	3000	11	84900.310229	84900.310229
8	3 to 4 km from a Salmon Stream	4000	10	81500.157388	81500.157388
8	Within 1km of Salmon Stream	1000	19	86339.509315	86339.509315
9	1 to 2 km from a Salmon Stream	2000	21	85766.233325	85766.233325
9	2 to 3 km from a Salmon Stream	3000	15	84900.310229	84900.310229
9	3 to 4 km from a Salmon Stream	4000	4	81500.157388	81500.157388
9	Within 1km of Salmon Stream	1000	14	86339.509315	86339.509315
23	1 to 2 km from a Salmon Stream	2000	5	85766.233325	85766.233325

Add a field named Count_KM2 and compute the density of bears per KM2 for each row in your table. (100 ha = 1km^2)

SummaryStatisticsTable

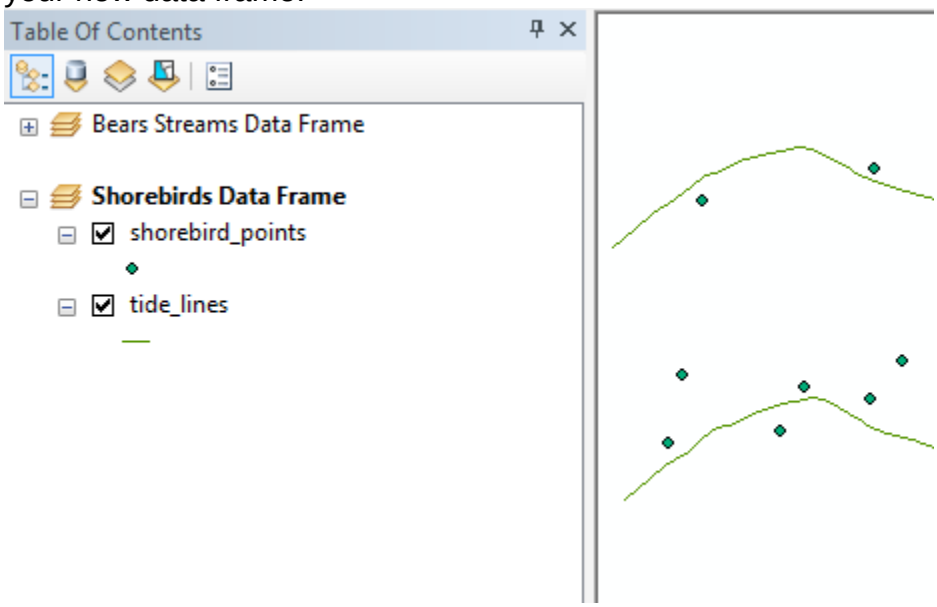
	BEARS_ID	Class	distance	FREQUENC	Count_KM2
	7	1 to 2 km from a Salmon Stream	2000	8	0.009
	7	2 to 3 km from a Salmon Stream	3000	12	0.014
	7	3 to 4 km from a Salmon Stream	4000	13	0.016
	7	Within 1km of Salmon Stream	1000	15	0.017

Finally use the ***Sort*** geoprocessing tool to sort your table by Bear ID and distance values.

BEARS_ID	Class	FREQUENCY	Count_KM2
7	Within 1km of Salmon Stream	15	0.017373
7	1 to 2 km from a Salmon Stream	8	0.009328
7	2 to 3 km from a Salmon Stream	12	0.014134
7	3 to 4 km from a Salmon Stream	13	0.015951
8	Within 1km of Salmon Stream	19	0.022006
8	1 to 2 km from a Salmon Stream	10	0.01166
8	2 to 3 km from a Salmon Stream	11	0.012956
8	3 to 4 km from a Salmon Stream	10	0.01227
9	Within 1km of Salmon Stream	14	0.016215
9	1 to 2 km from a Salmon Stream	21	0.024485
9	2 to 3 km from a Salmon Stream	15	0.017668
9	3 to 4 km from a Salmon Stream	4	0.004908
23	Within 1km of Salmon Stream	50	0.057911

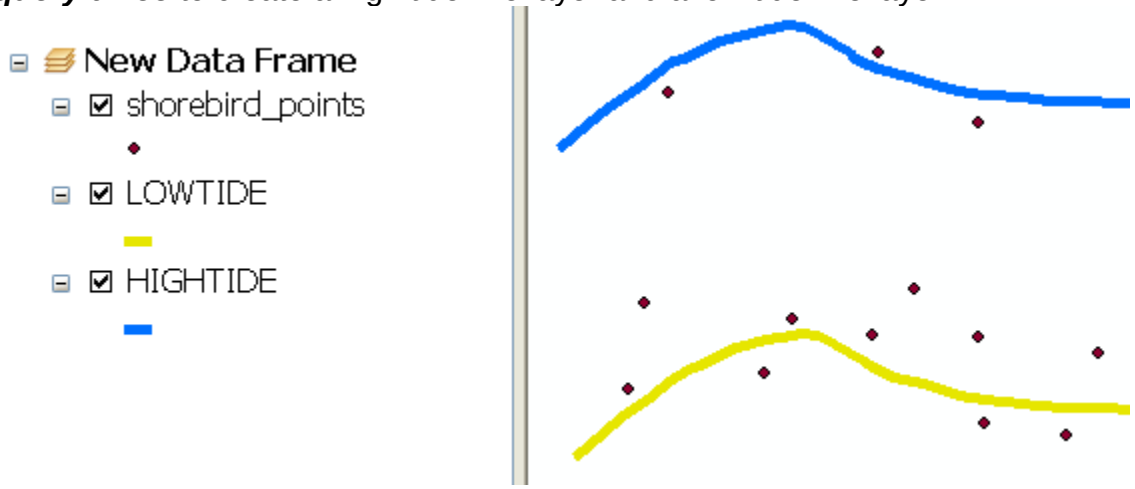
Shorebird Feature Dataset

Insert a new dataframe (Insert menu) and add the shorebird feature dataset to your new data frame:



What is the mean nearest distance to low tide and high tide for each species of shorebird?

This question is easy to answer by first creating a field of the closest distance to low tide and another field of closest distance to high tide. Then you could solve the problem using the Summary Statistics geoprocessing tool. Use the ***layer definition query twice*** to create a high tide line layer and a low tide line layer.



Next use the ***Near*** geoprocessing tool to determine the nearest distance from each shorebird point to the low tide line.

shorebird_points

Shape *	SPECIES	NEAR_FID	NEAR_DIST
Point	Ruddy Turnstone	1	433.644131
Point	Ruddy Turnstone	1	471.955326
Point	Ruddy Turnstone	1	431.244283
Point	Ruddy Turnstone	1	444.860653
Point	Ruddy Turnstone	1	449.077055
Point	Ruddy Turnstone	1	438.255307
Point	Ruddy Turnstone	1	460.463387
Point	Ruddy Turnstone	1	433.147166
Point	Black Ostercatch	1	31.193333
Point	Black Ostercatch	1	52.40355

Add a field named DistLowTide and calculate that field to equal NEAR_DIST. Then delete your NEAR_FID, NEAR_DIST fields.

shorebird_points

Shape *	SPECIES	DistLowTide
Point	Ruddy Turnstone	433.644131
Point	Ruddy Turnstone	471.955326
Point	Ruddy Turnstone	431.244283
Point	Ruddy Turnstone	444.860653
Point	Ruddy Turnstone	449.077055
Point	Ruddy Turnstone	438.255307
Point	Ruddy Turnstone	460.463387
Point	Ruddy Turnstone	433.147166
Point	Black Ostercatch	31.193333
Point	Black Ostercatch	52.40355

Repeat the process for the nearest distance to the high tide line…

shorebird_points

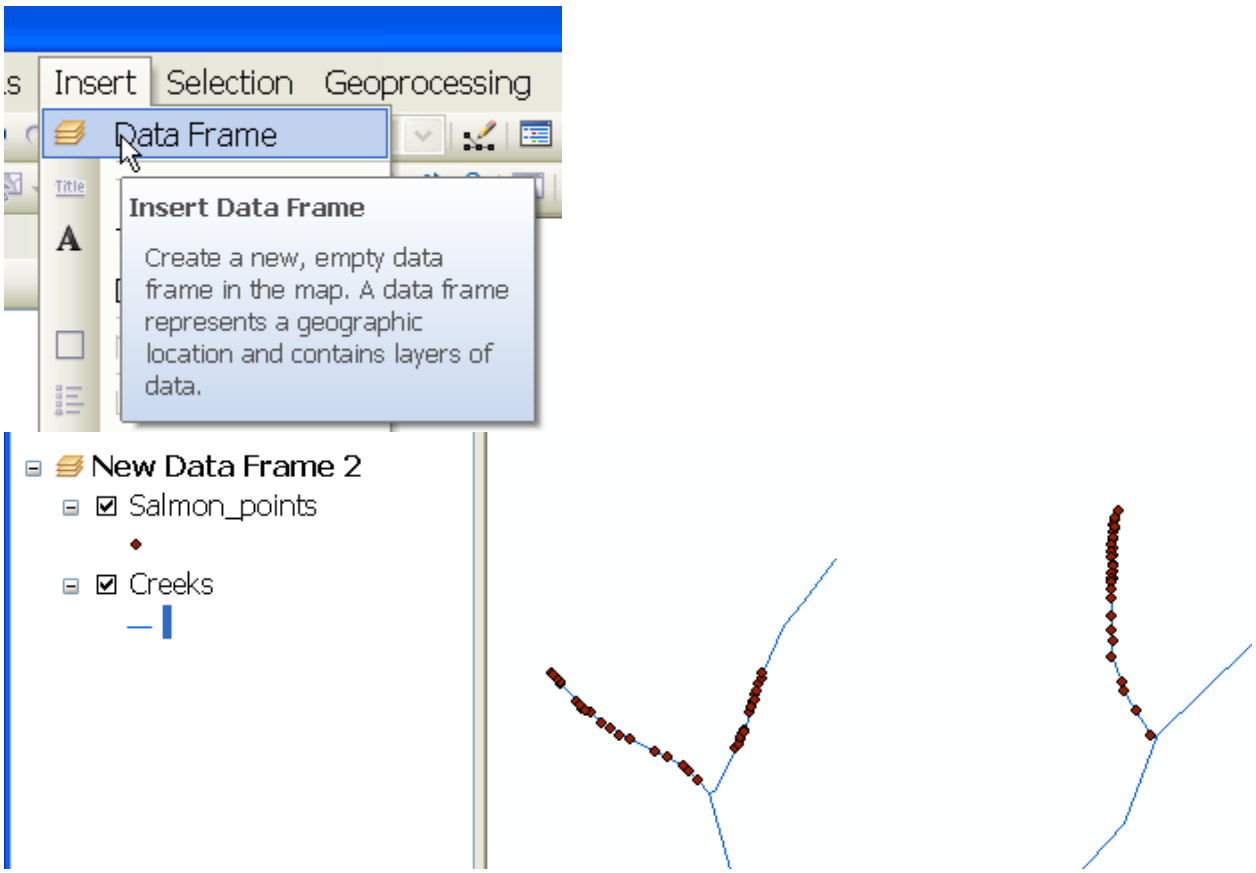
SPECIES	DistLowTide	DistHighTide
Ruddy Turnstone	433.644131	38.906864
Ruddy Turnstone	471.955326	23.228593
Ruddy Turnstone	431.244283	48.344397
Ruddy Turnstone	444.860653	54.521951
Ruddy Turnstone	449.077055	53.349635
Ruddy Turnstone	438.255307	43.654512
Ruddy Turnstone	460.463387	24.564835
Ruddy Turnstone	433.147166	46.602336
Black Ostercatch	31.193333	410.270334
Black Ostercatch	52.40355	490.887616

Finally, use the ***Summary Statistics*** tool with to determine the mean, minimum, and maximum distance to the closest high and low tide line by species.

SPECIES	FREQUENCY	MEAN_DistL	MEAN_DistH
Black Ostercatch	9	40.4	475.5
Dunlin	10	87.4	388.5
Ruddy Turnstone	8	445.3	41.6

Black Ostercatchers and Dunlins average closer to the low tide line, while Ruddy Turnstones average closer to the high tide line…

Salmon Feature Dataset



We have a problem here look good…but the salmon points are not exactly on the stream lines… so the Intersect geoprocessing tool will not work! You can either use the ***Snap*** geoprocessing tool to snap all salmon locations to their closest stream line and then use ***Intersect*** geoprocessing tool , or use the ***Spatial Join*** (closest) geoprocessing tool.

For these 3 creeks, create a table of the number of salmon by species. There is some positional error in the points and lines so the salmon locations are not exactly on a line.

Use the ***Frequency*** geoprocessing tools to create your table. Then use the ***Sort*** geoprocessing tool to sort by stream name and salmon species.

SPECIES	NAME	FREQUENCY
1	Flat Creek	27
2	Flat Creek	5
1	Ptarmigan Creek	17
2	Ptarmigan Creek	4
1	Willow Creek	11
2	Willow Creek	6