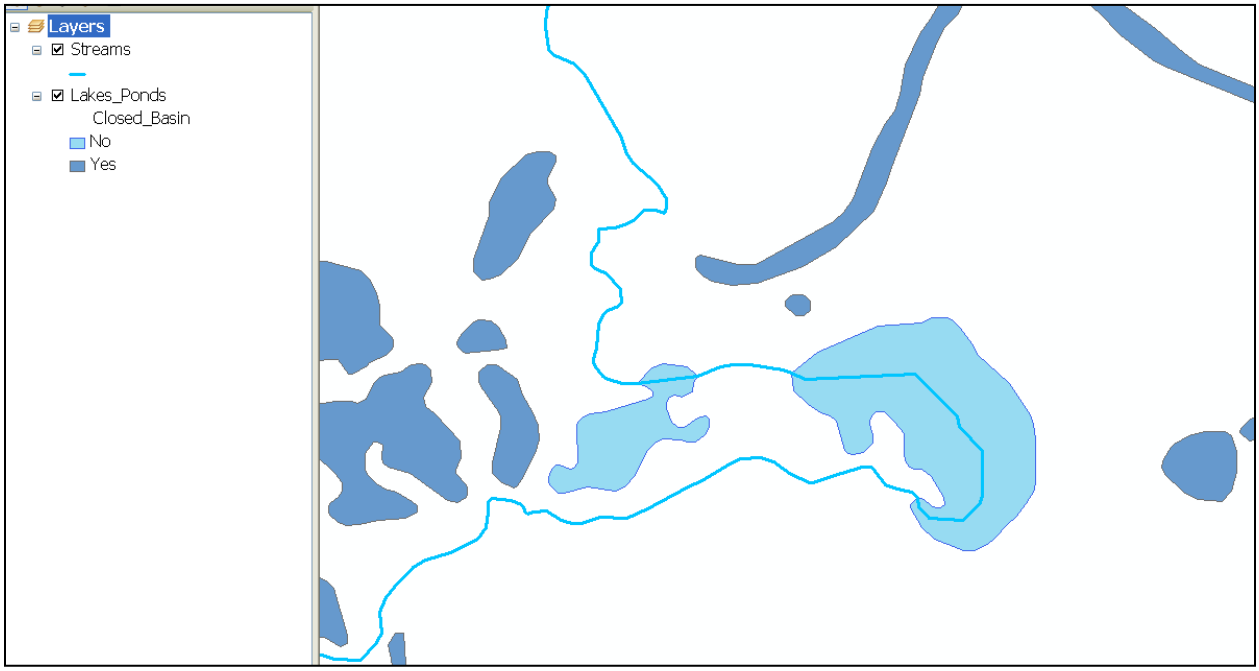
Exercise#3: Steam Distance and Connectivity

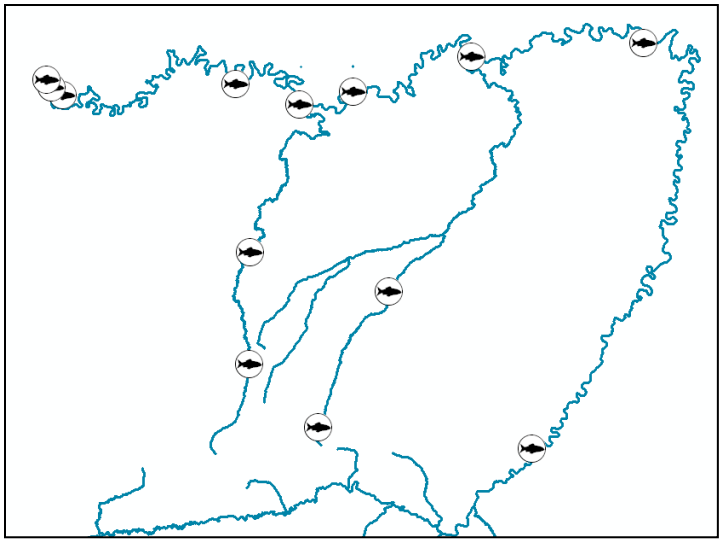
In this exercise, we will classify lakes and ponds as either connected to a stream or closed basin.



You will also determine the number and area of lakes connected to each stream:

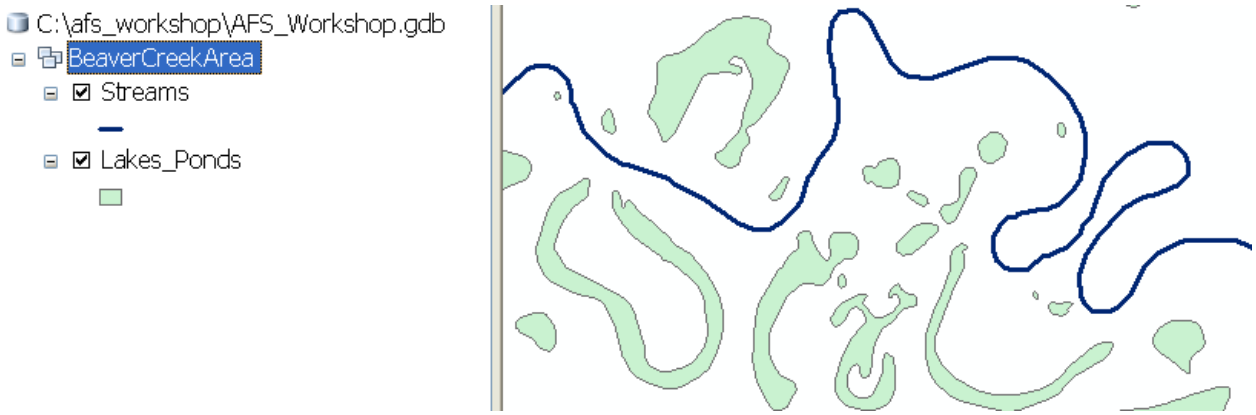
Stream_Name	Lake_Count	Lake_Hectares
Big Creek	5	59.0
Jefferson Creek	5	32.0
West Fork Flat Creek	4	11.6
Colorado Creek	2	4.1
East Fork Flat Creek	1	3.2
Flat Creek	2	2.3
Nome Creek	1	1.2
Montana Creek	1	0.6
Little Champion Creek	1	0.5
Wickersham Creek	1	0.4
Bear Creek	0	0.0
Beaver Creek	0	0.0
Brigham Creek	0	0.0
Bull Creek	0	0.0
Champion Creek	0	0.0
Deadwood Creek	0	0.0

And for fish locations, the total distance downstream to the Yukon River…

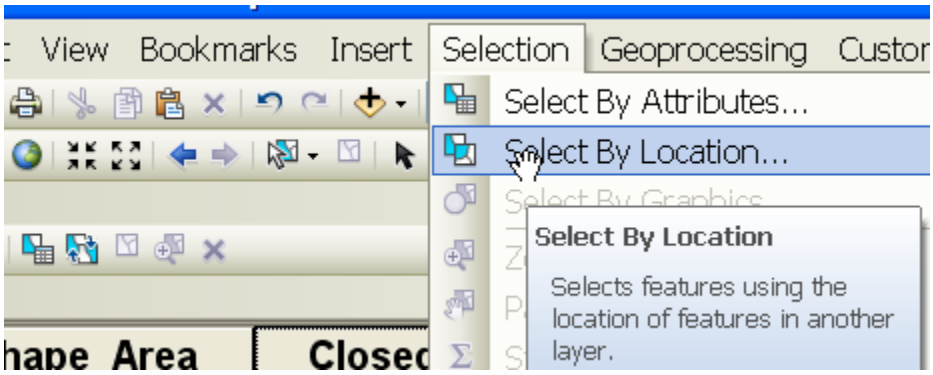


Lakes Connected to Streams

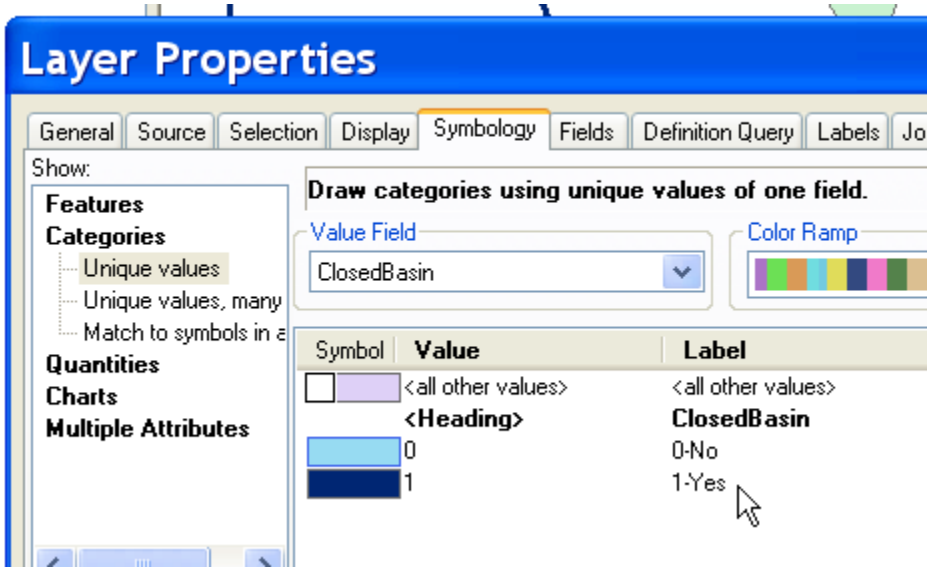
Add the Streams line feature class and polygon feature class Lakes_Ponds from the BeaverCreekArea feature dataset to your Arcmap data frame.

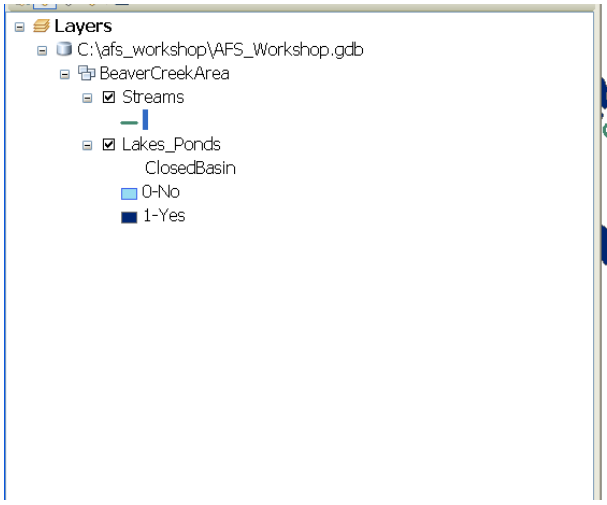


Next add a Short Integer field named ClosedBasin to your polygon attribute table and calculate the value to be 1 for all polygon records. The use the Select By Location menu to select polygons that intersect with streams lines and calculate these to have a ClosedBasin value of 0.



Next symbolize your polygons based on the ClosedBasin field.





Lake Counts By Stream

Use the Dissolve geoprocessing tool to create a continuous line for each stream name.

Streams_Dissolved

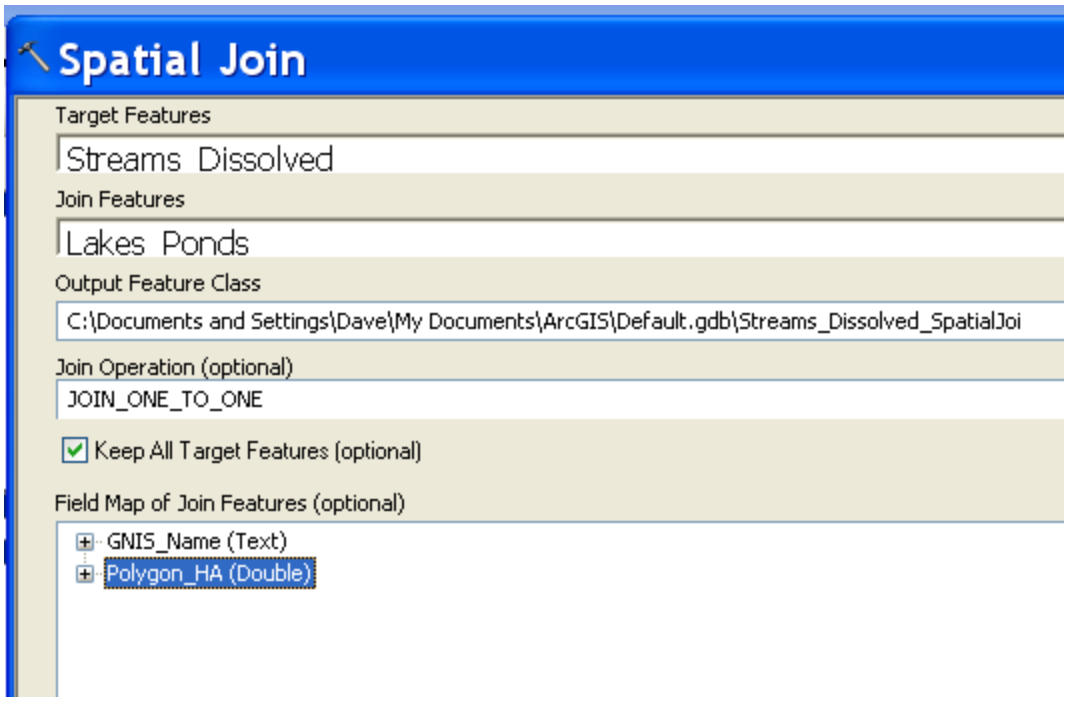
OBJECTID *	Shape *	GNIS_Name
1	Polyline	Bear Creek
2	Polyline	Beaver Creek
3	Polyline	Big Creek
4	Polyline	Brigham Creek
5	Polyline	Bull Creek
6	Polyline	Champion Creek
7	Polyline	Colorado Creek
8	Polyline	Deadwood Creek
9	Polyline	East Fork Flat Creek
10	Polyline	Fish Creek
11	Polyline	Flat Creek

For each stream, we want to know the total count and hectares of lakes that are connected. First create a double precision field and compute polygon geometry of Hectares for each lake polygon.

Lakes_Ponds

Shape *	ClosedBasin	Polygon_HA
Polygon ZM	0	0.29
Polygon ZM	0	0.61
Polygon ZM	0	20.36
Polygon ZM	0	7.72
Polygon ZM	0	0.29
Polygon ZM	0	0.36

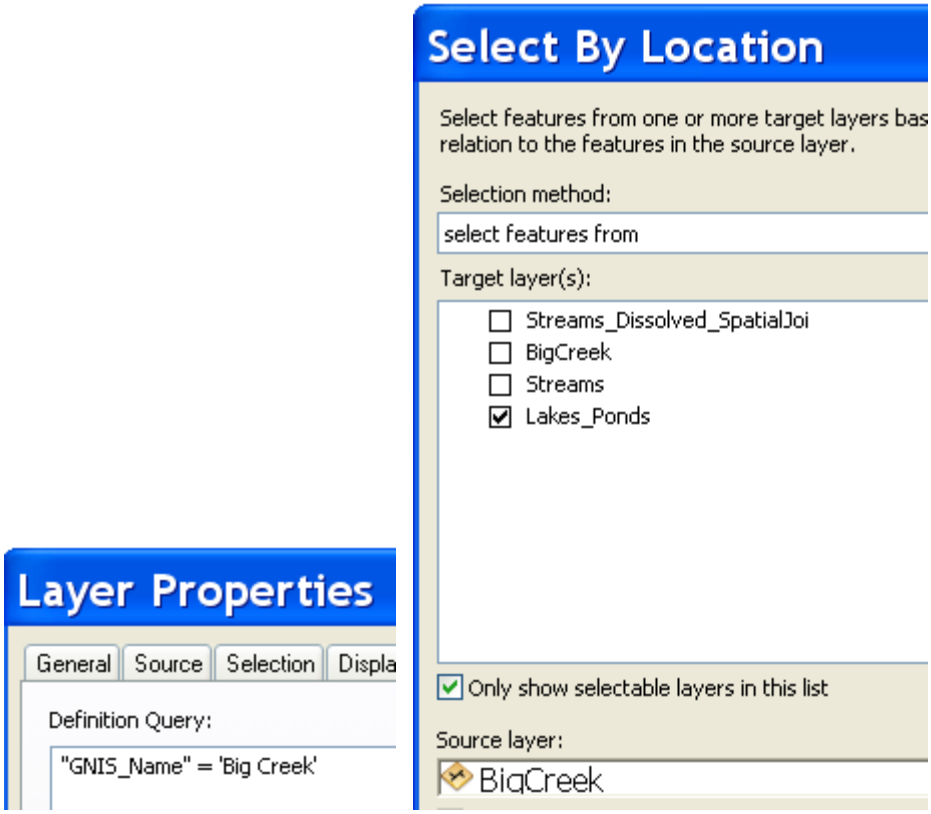
Then use the Spatial Join geoprocessing tool to determine the lakes connected to each stream..



Streams_Dissolved_SpatialJoi

	Shape *	Join_Count	GNIS_Name	Polygon_HA
	Polyline ZM	5	Big Creek	1.488087
	Polyline ZM	5	Jefferson Creek	20.360742
	Polyline ZM	4	West Fork Flat Creek	7.722658
	Polyline ZM	2	Colorado Creek	0.285828

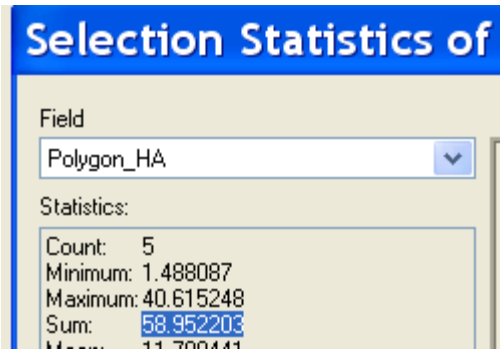
So for example, Big Creek had 5 lake polygons with a total of 1.49 hectares…check this to make sure it is correct…



Lakes_Ponds

	Shape *	ClosedBasin	Polygon_HA
▸	Polygon ZM	0	1.49
	Polygon ZM	0	3.59
	Polygon ZM	0	6.38
	Polygon ZM	0	40.62
	Polygon ZM	0	6.88

So 5 ponds are connected to Big Creek, but the total polygon hectares should be the sum of Polygon_Ha…



Clear your selection and use the ***Spatial Join*** one to many

Streams_Dissolve_SpatialJoin

Shape *	Join_Count	GNIS_Name	Polygon_HA
Polyline ZM	1	Big Creek	1.488087
Polyline ZM	1	Big Creek	3.588142
Polyline ZM	1	Big Creek	6.375906
Polyline ZM	1	Big Creek	40.615248
Polyline ZM	1	Big Creek	6.88482

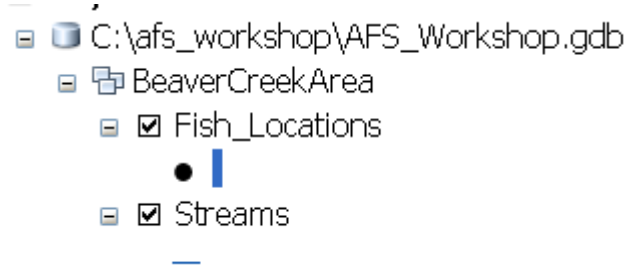
and ***Frequency*** geoprocessing tool to create a table listing the count and total hectares of lakes for each stream.

Frequency_output_table

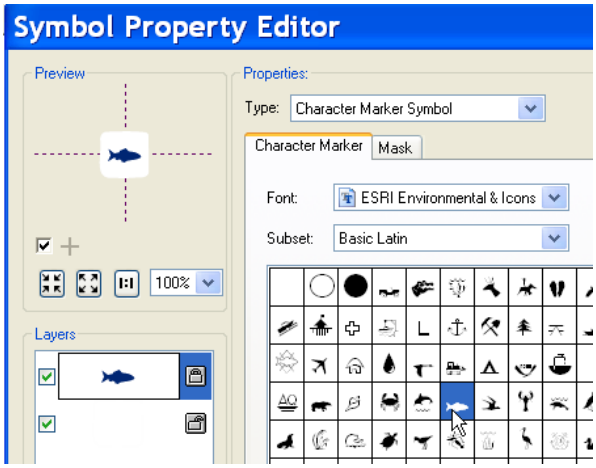
GNIS_Name	Join_Count	Polygon_HA
Big Creek	5	59.0
Jefferson Creek	5	32.0
West Fork Flat Creek	4	11.6
Colorado Creek	2	4.1
East Fork Flat Creek	1	3.2
Flat Creek	2	2.3
Nome Creek	1	1.2
Montana Creek	1	0.6
Little Champion Creek	1	0.5
Wickersham Creek	1	0.4
Bear Creek	0	<Null>
Beaver Creek	0	<Null>
Brigham Creek	0	<Null>

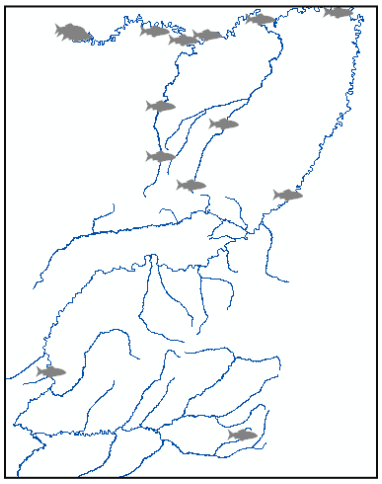
Fish Distance From Yukon River

Create a new data frame and add the point feature class representing fish locations and the line feature class representing streams.



We want to symbolize each location with a fish marker, so add the ESRI style to your list of symbols..





The Yukon River is in the upper left, so create a measured route

Streams

GNIS_Name	Shape_Length	Route_ID
Beaver Creek	30.384194	
Beaver Creek	200.695469	
Beaver Creek	2479.565959	
Beaver Creek	4803.785393	
Bear Creek	1556.200812	
O'Brien Creek	1342.920414	
Sheep Creek	1495.020873	
Mascot Creek	48.655991	
Big Creek	4148.121927	
Jefferson Creek	2373.719118	
Jefferson Creek	2507.857871	

Field Calculator

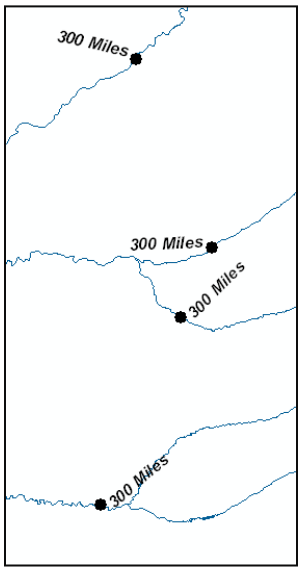
Parser
VB Script Python

Fields:
OBJECTID_1
Shape
GNIS_Name
Shape_Length
Route_ID

Show Codeblock

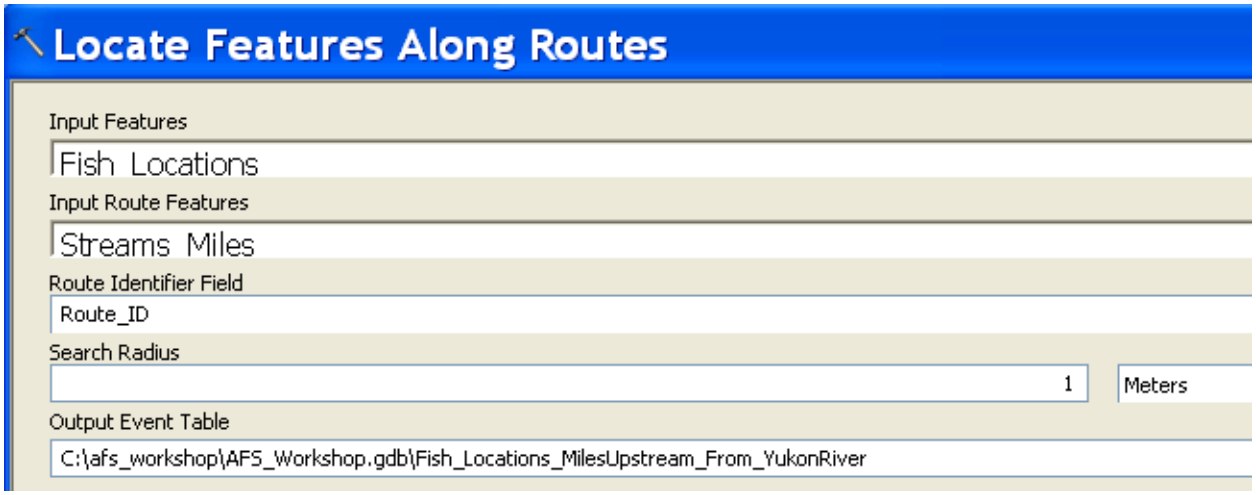
Route_ID =
1

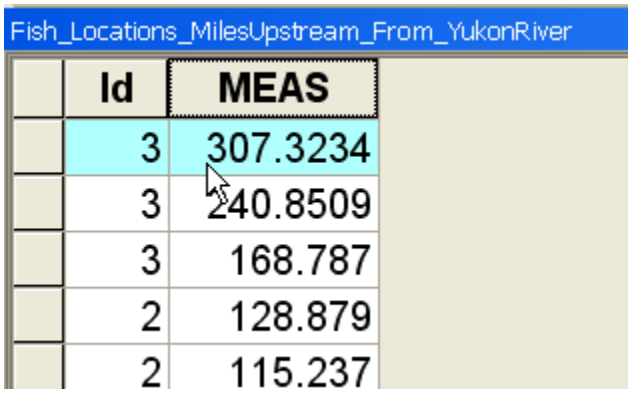
Add a field and compute the line lengths in miles. Then create a measured route system in miles.



Symbolize every 100 miles going upstream along the measured route system.

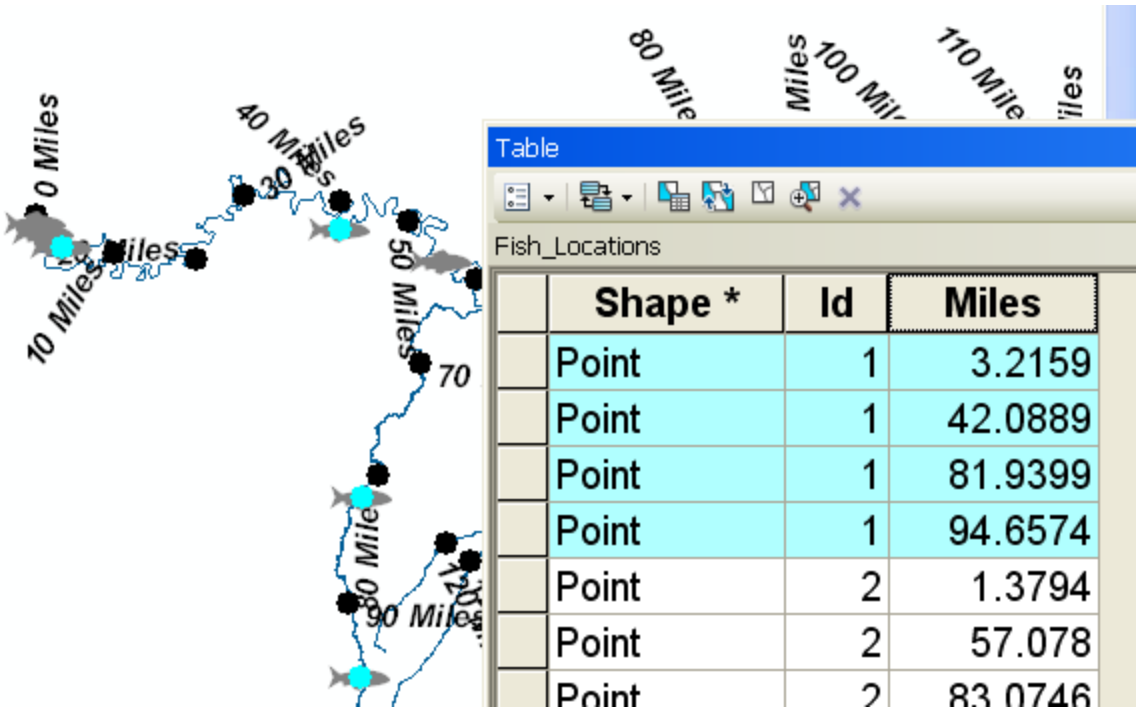
For each location, we want to know the distance in miles from the Yukon River.





So Fish ID 3 had a location the farthest upstream from the Yukon at 307 miles…

Use the ***Join Field*** geoprocessing tool to transfer the Miles measurement to the original points featue class..



Shape *	Id	Miles
Point	1	3.2159
Point	1	42.0889
Point	1	81.9399
Point	1	94.6574
Point	2	1.3794
Point	2	57.078
Point	2	83.0746