Linear Referencing Lab

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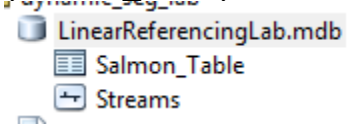
Lab4 Measured Line Analysis Data

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

You have a line feature class of salmon streams and a table (Salmon_Table) of 50 meter segments that are sampled along each stream.



In this lab you will answer 4 questions:

Question 1) What stream had the greatest density of salmon?

Question 2) What is the maximum number of sockeyes, kings, and silvers per 50-meter sample, for each stream?

Question 3) Where are the stream segments had no sockeye salmon?

Question 4) Where are the stream segments that had the maximum sockeyes, kings, and silvers?

The first two questions are answered using tabular analysis.

Questions 3 and 4 are answered using dynamic segmentation…

Question 1) What stream had the greatest density of salmon?
Add an integer field named *Total* to your table.
Compute the total salmon in each 50m section.

Salmon_Table

From_	To_	Sockeyes	Kings	Silvers	Total
0	50	0	0	15	15
50	100	0	3	16	19
100	150	0	1	14	15
150	200	0	7	10	17

Next, for each streamID determine the total number of salmon….use either the ***Frequency*** or ***Summary Statistics*** geoprocessing tool.

ID	FREQUENCY	TOTAL
51	23	150
52	22	228
53	22	78
54	8	149
55	17	277
56	7	220
57	9	194

For your streams line attribute table, add a double precision field named Stream_KM and compute geometry for line length in kilometers

MS_ID	STREAM_NAM	Stream_KM
51	Big Creek	1.154602
53	Moose Creek	1.128321
54	Flat Creek	0.399266
55	Bear Creek	0.844629

At this point you have a table with the total number of salmon for each stream and another table with the length of each stream.

To determine the density (number of salmon per stream KM), you need to join these two tables together. Use the ***Join Field*** tool to join the total salmon counts to your streams line (TARGET) attribute table.

Streams

Shape *	STREAM_NAM	Stream_KM	STREAMS_ID
Polyline	Big Creek	1.154602	51
Polyline	Moose Creek	1.128321	53
Polyline	Flat Creek	0.399266	54
Polyline	Bear Creek	0.844629	55
Polyline	Ptarmigan Creek	0.329925	56
Polyline	Willow Creek	0.450138	57
Polyline	Clear Creek	1.129117	52

0 (0 out of 7 Selected)

Salmon_Table Streams

Salmon_Table_Frequency

ID	TOTAL
51	150
52	228
53	78
54	149
55	277
56	220
57	194

Output after using Join Field geoprocessing tool:

Streams

Shape *	STREAM_NAM	Stream_K	STREAMS_ID	TOTAL
Polyline	Big Creek	1.154602	51	150
Polyline	Clear Creek	1.129117	52	228
Polyline	Moose Creek	1.128321	53	78
Polyline	Flat Creek	0.399266	54	149
Polyline	Bear Creek	0.844629	55	277
Polyline	Ptarmigan Creek	0.329925	56	220
Polyline	Willow Creek	0.450138	57	194

Add a field for salmon density and compute the density of salmon per km of stream…then sort descending.

Streams

STREAM_NAM	Stream_K	STREAMS_ID	TOTAL	SALMON_DENSITY
Ptarmigan Creek	0.329925	56	220	666.8
Willow Creek	0.450138	57	194	431.0
Flat Creek	0.399266	54	149	373.2
Bear Creek	0.844629	55	277	328.0
Clear Creek	1.129117	52	228	201.9
Big Creek	1.154602	51	150	129.9
Moose Creek	1.128321	53	78	69.1

Notice that Ptarmigan Creek had the highest density of salmon per stream KM.

Question 2) What is the maximum number of sockeyes, kings, and silvers per 50-meter sample, for each stream?

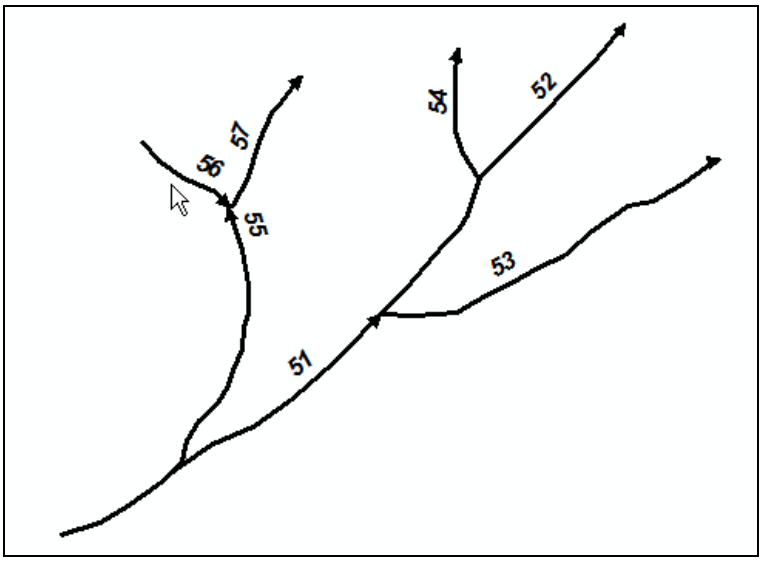
Easy!. . .Summary Statistics tool…..Case field of ID to get Max by stream ID

ID	FREQUENCY	MAX_Sockeyes	MAX_Kings	MAX_Silvers
51	23	0	8	16
52	22	0	11	21
53	22	0	8	10
54	8	23	7	8
55	17	19	10	12
56	7	15	10	25
57	9	19	7	18

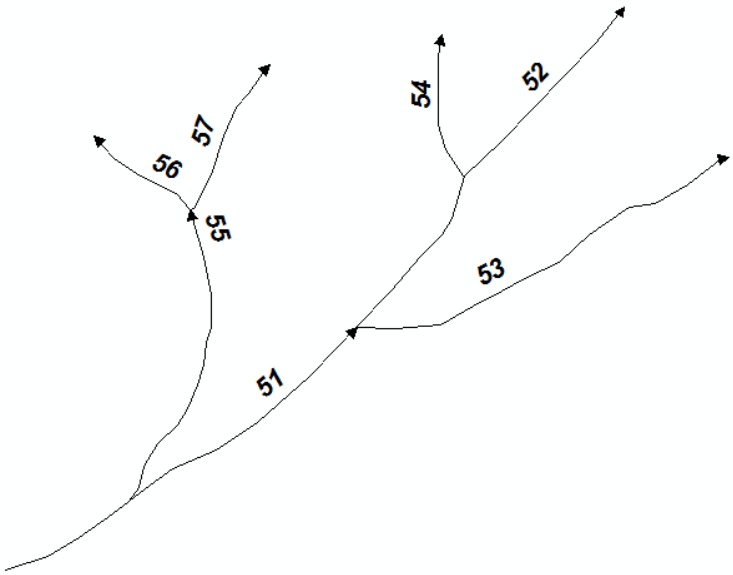
Use dynamic segmentation, also called linear referencing, to answer questions 3 and 4.

ArcGIS Linear Referencing

The direction of stream lines are important we sampled each stream walking upstream, so the lines should go upstream… as they represent the from- and to- directions in the line theme…use an arrow at end symbol to see this relationship…There is one route (streams-id 56) that is going the wrong direction for the measures….downstream instead of upstream…



Use the ***Flip Line*** geoprocessing tool so all stream lines go upstream.

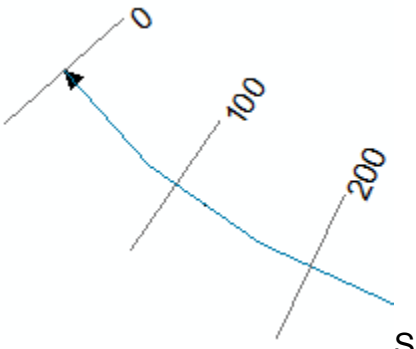


Use the ***Create Routes*** geoprocessing tool to create a measured line for each stream, based on the stream ID, with the measures starting in the lower left. Note that you can tell from the shape property whether a line theme contains measures (Polyline ***M***)

Shape *	STREAMS_ID *
Polyline M	51
Polyline M	52
Polyline M	53
Polyline M	54
Polyline M	55
Polyline M	56
Polyline M	57

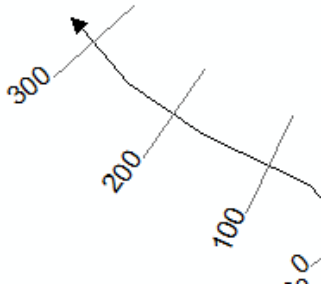
Each unique streams-id will be a route...the origin of each route is the lower left of the stream network, the measure of each stream will be meters since the X,Y coordinates are in meters. Hatch your measured lines with a symbol and label every 100 meters.

Since we specified to start at the lower left, there is one stream that has the measures going downstream…



Select this line…and start editing your layer

Use the edit tool  from the Editor toolbar and double-click on your line.
Edit Vertices..
Right mouse click…Route Measure Editing….Drop Measures
Right mouse click…Flip Line
Right mouse click… Route Measure Editing….Set As Distance
Editor→Save Edits! Stop Editing



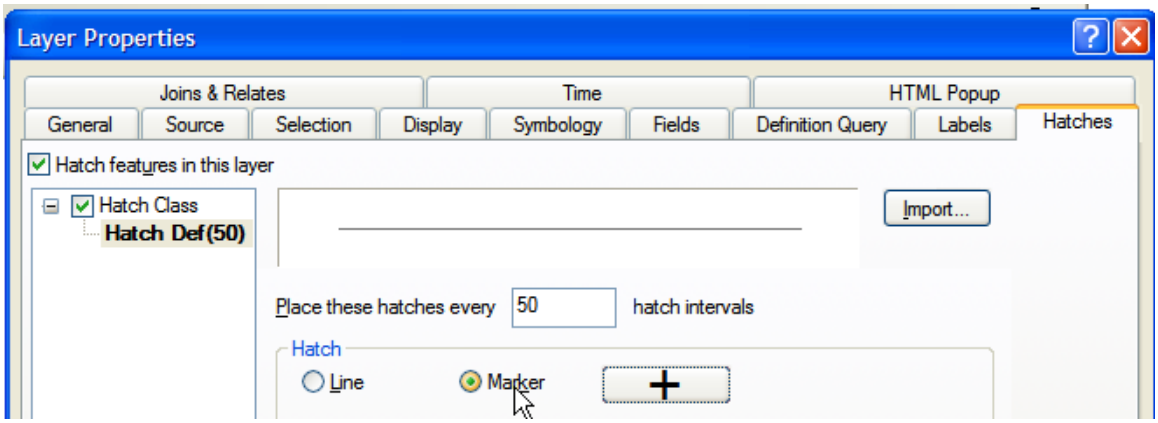
Use the ***Join Field*** geoprocessing tool to transfer all the attributes from your original streams line theme to your measured routes layer

Measured_Streams

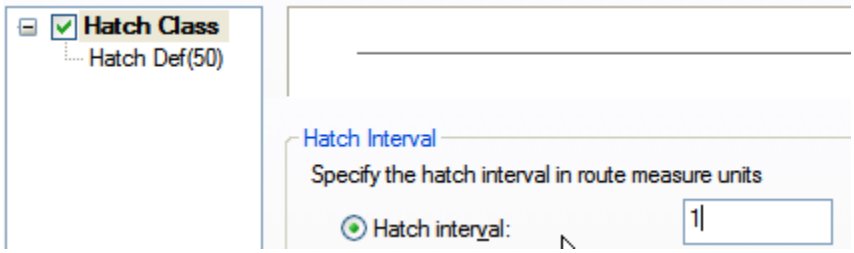
Shape *	STREAMS_ID	STREAM_NAM	Stream_KM	Sum_Total	Density
Polyline M	51	Big Creek	1.154602	150	129.914905
Polyline M	52	Clear Creek	1.129117	228	201.927617
Polyline M	53	Moose Creek	1.128321	78	69.129256

Use the ***Make Route Event Layer*** tool to make an Arcmap layer from *Salmon_Table* to display your events on your measured lines.

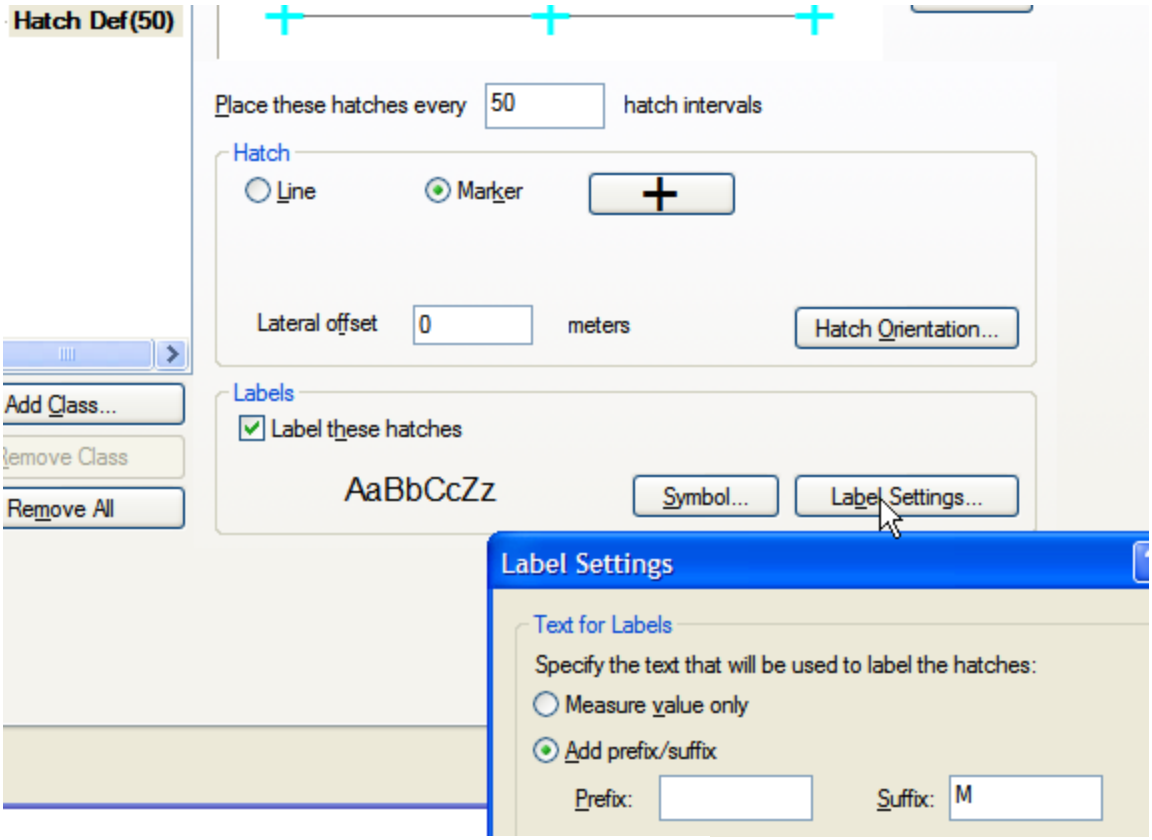
You can symbolize each measured line so that it has a hatch symbol every 50-meters:

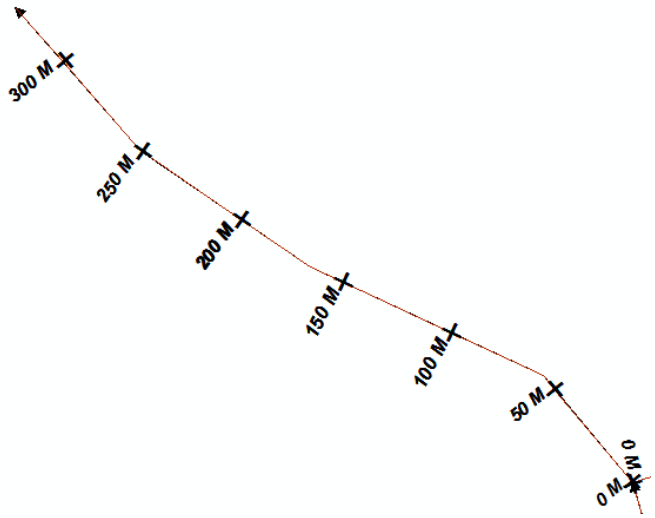


Here we put a marker every 50 intervals and Hatch Class is 1 meter intervals



You can label each hatch


Hatch Def(50)
Place these hatches every 50 hatch intervals
Hatch
Line
Marker
Lateral offset 0 meters
Hatch Orientation...
Add Class...
Remove Class
Remove All
Labels
Label these hatches
AaBbCcZz
Symbol...
Label Settings...
Label Settings
Text for Labels
Specify the text that will be used to label the hatches:
Measure value only
Add prefix/suffix
Prefix:
Suffix: M


300 M
250 M
200 M
150 M
100 M
50 M
0 M
0 M

.

Question 3) Where are the stream segments had no sockeye salmon?
Use the Make Feature Layer tool to create a layer showing all 50-meter stretches that had a Sockeyes count of zero.

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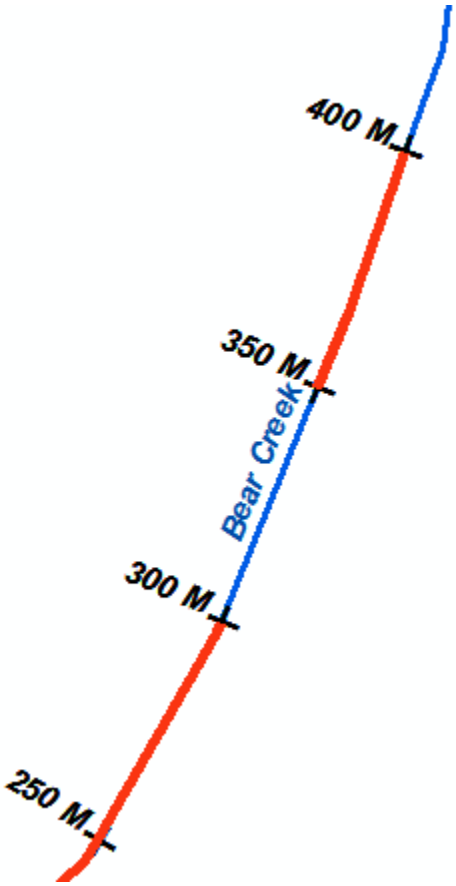
And modify your measured streams properties to see stream name as labels.

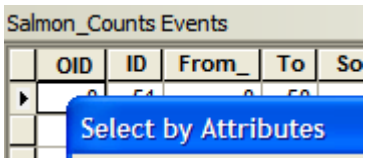


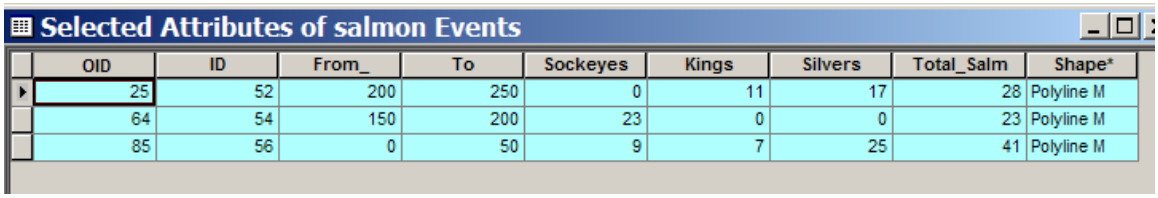
As an example, Bear Creek had no sockeyes counted between 250-300 and 350-400 meters

Use the ***Copy Features*** geoprocessing tool to save your No Sockeyes layer to your geodatabase container.

Question 4) Where are the stream segments that had the maximum sockeyes, kings, and silvers?

Select the 50-meter stretches that had the maximum counts.





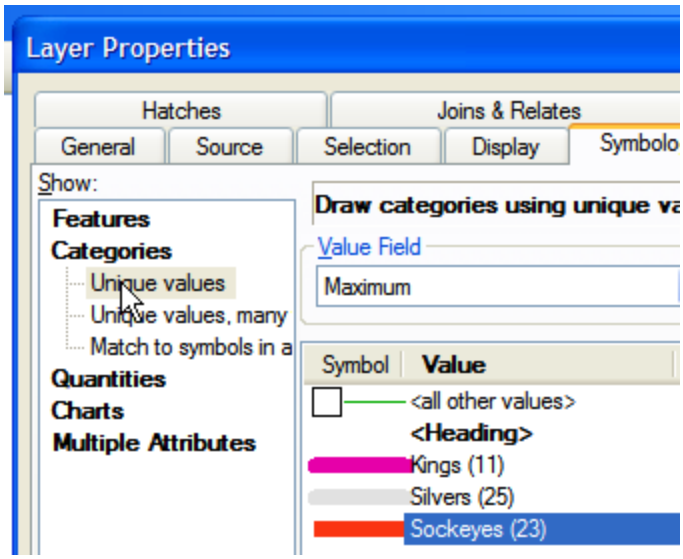
OID	ID	From_	To	Sockeyes	Kings	Silvers	Total_Salm	Shape*
25	52	200	250	0	11	17	28	Polyline M
64	54	150	200	23	0	0	23	Polyline M
85	56	0	50	9	7	25	41	Polyline M

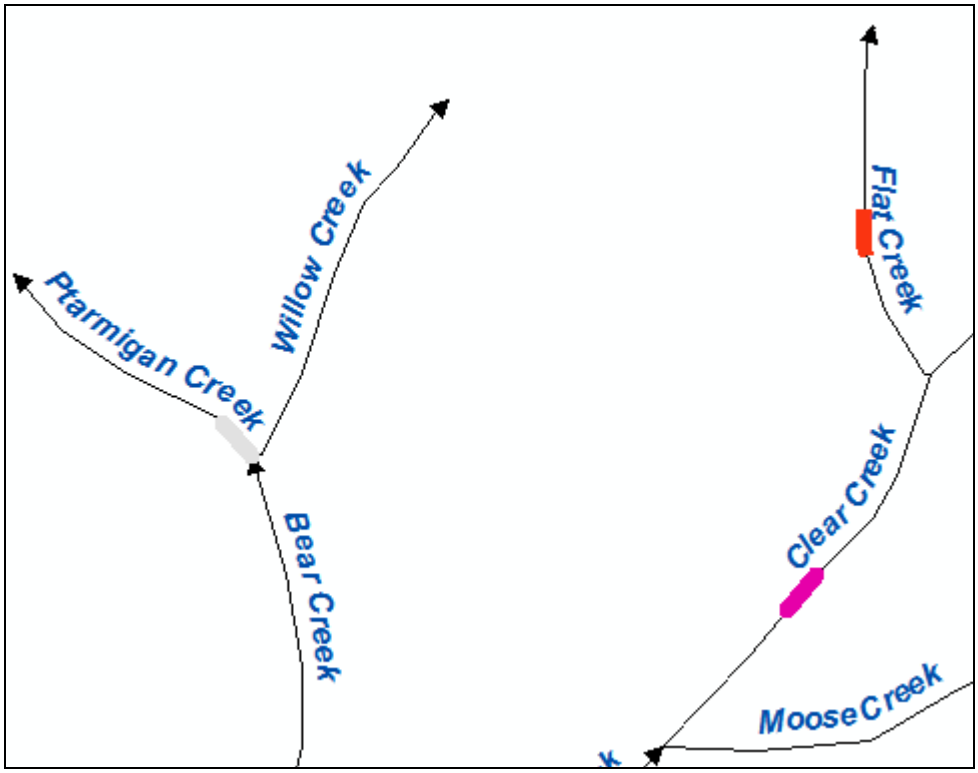
Use the ***Copy Features*** geoprocessing tool to save your MaxCounts layer to your geodatabase container.

Add a text field named Maximum to your table and calculate the field values as follows:

Shape *	ID	From_	To	Sockeyes	Kings	Silvers	Total	Maximum
Polyline M	52	200	250	0	11	17	28	Kings (11)
Polyline M	54	150	200	23	0	0	23	Sockeyes (23)
Polyline M	56	0	50	9	7	25	41	Silvers (25)

Then use the maximum field to symbolize by that category.


Layer Properties
Hatches
Joins & Relates
General
Source
Selection
Display
Symbolo
Show:
Features
Categories
Unique values
Unique values, many
Match to symbols in a
Quantities
Charts
Multiple Attributes
Draw categories using unique va
Value Field
Maximum
Symbol
Value
<all other values>
<Heading>
Kings (11)
Silvers (25)
Sockeyes (23)


Willow Creek
Ptarmigan Creek
Bear Creek
Flat Creek
Clear Creek
Moose Creek