

Testing the Feasibility of Converting the Data of a Habitat Model into a Relational Geodatabase

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Subbasin Planning

- In 2001, the Northwest Pacific Power Conservation Council called for subbasin plans to be completed by May of 2004 and adopted into the Council's Columbia River Basin Fish and Wildlife Program to guide migration funding from Bonneville Power Administration's hydropower complex. www.nwcouncil.org
- Technical Outreach and Assistance to Subbasin Teams (TOAST) was responsible for assisting in the planning process, mainly fish and wildlife modeling and restoration planning.

EDT

Ecosystem Diagnosis and Treatment

<http://www.mobrand.com/edt>

A tool used to analyze environmental information and draw conclusions about the ecosystem from the salmon's perspective.

Stream Reach Editor

Attribute Code	Attribute Name	Data Type	Pattern by Month
FlwDielVar	Flow - intra daily (diel) variation	0 to 4 rating	yes
FlwHigh	Flow - change in interannual variability in high flows	0 to 4 rating	yes
FlwIntraAnn	Flow - intra-annual flow pattern	0 to 4 rating	yes
FlwLow	Flow - changes in interannual variability in low flows	0 to 4 rating	yes
HydroRegimeNatural	Hydrologic regime - natural	0 to 4 rating	no
HydroRegimeReg	Hydrologic regime - regulated	0 to 4 rating	no
ChLength	Channel length	miles	no
WidthMn	Channel month Minimum width (ft)	feet	yes
WidthMx	Channel month Maximum width (ft)	feet	yes
TempMonMx	Temperature - daily maximum (by month)	0 to 4 rating	yes
TempMonMn	Temperature - daily minimum (by month)	0 to 4 rating	yes
TempSpVar	Temperature - spatial variation	0 to 4 rating	yes
Isong	Isong	0 to 4 rating	yes
HbSmCbl	Habitat type - small cobble/gravel riffles	%	no
HbGlide	Habitat type - Glides	%	no
HbPw	Habitat type - primary pools	%	no
HbPTails	Habitat type - pool tailouts	%	no
HbBckPis	Habitat type - backwater pools	%	no
HbBvrPnds	Habitat type - beaver ponds	%	no
HbOCHCfr	Habitat type - off-channel habitat factor	%	no
Cbstr	Obstructions to fish migration	yes or no	yes
Confine	Confinement - natural	0 to 4 rating	no
ConfineHydro	Confinement - Hydromodifications	0 to 4 rating	no
Grad	Gradient	%	no
BdScour	Bed scour	0 to 4 rating	yes
FinSed	Fine sediment	0 to 4 rating	no
Emb	Embeddedness	0 to 4 rating	no
Turb	Turbidity	0 to 4 rating	yes
MiscToxWat	Miscellaneous toxic pollutants - water column	0 to 4 rating	no
MiscSedSs	Metals/Pollutants - in sediments/soils	0 to 4 rating	no
MetWatCol	Metals - in water column	0 to 4 rating	no
NutEnrich	Nutrient enrichment	0 to 4 rating	yes
DissOxy	Dissolved oxygen	0 to 4 rating	yes
Alka	Alkalinity	0 to 4 rating	no
BenthComRch	Benthos diversity and production	0 to 4 rating	no
FishComRch	Fish community richness	0 to 4 rating	no
FSIntro	Fish species introductions	0 to 4 rating	no
PredRisk	Predation risk	0 to 4 rating	yes
RipFunc	Riparian function	0 to 4 rating	no
Wood	Wood	0 to 4 rating	no
SalmonCarass	Salmon Carcasses	0 to 4 rating	no
HatchOutp	Hatchery fish outplants	0 to 4 rating	no
FishPath	Fish pathogens	0 to 4 rating	no
Harass	Harassment	0 to 4 rating	no
WdWat	Water withdrawals	0 to 4 rating	yes

Obstruction Data

Obstruction Type	Scenario	Species	Life Stage	Direction	Pattern by Month
Waterfall	T	Chinook	0 age Fingerling	Upstream	Jan to Dec
Dam	P	Steelhead	1 age Juvenile	Downstream	
Culvert		Coho	2+ age Juvenile		
Flow Diversion			Adult		
Irrigation Diversion			Emergent Fry		

Fifteenmile Subbasin

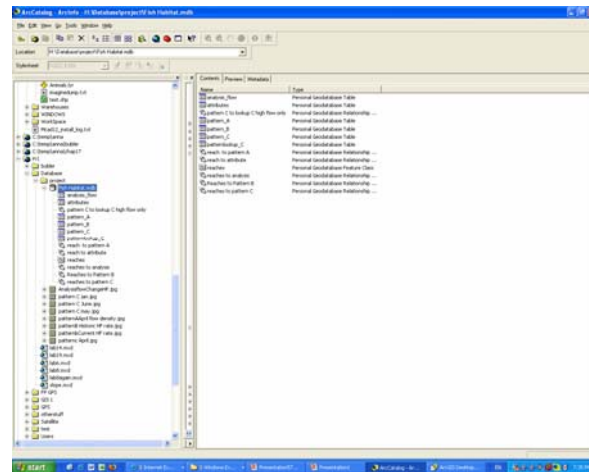


[illegible]

Techniques

Relationship Class

Geodatabase relationship classes are usually created to establish an enduring business process relationship between a feature class and another table or feature class



Simple
One-to-one
Relationship

Method

- Simple One-to-One relationship classes created
- Join table to spatial data Based On A Predefined Relationship Class
- Output

Pattern A

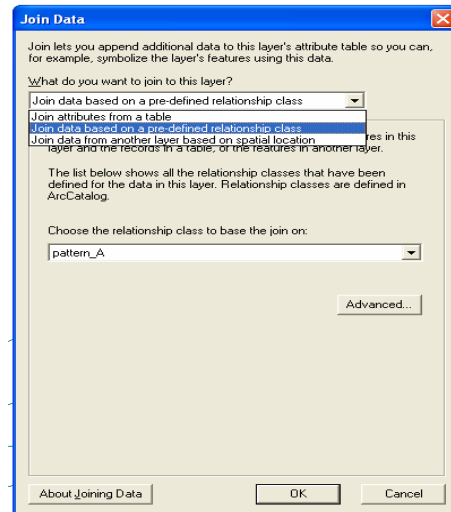
- Original Attribute Table + new key field
- One-to-One Simple relationship class
- Join of Table and Spatial dataset
- Current High Flow Patterns April, May, June

Table

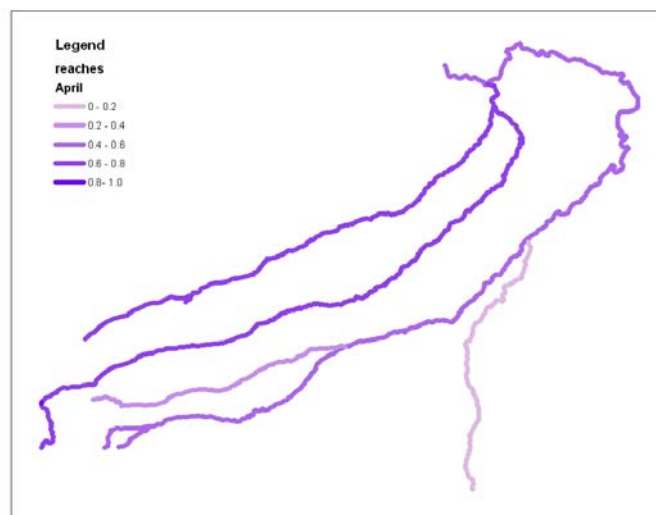
The screenshot shows the ArcCatalog interface with the 'Pattern A' table selected. The table has the following columns: OBJECTID, KEYTOPATT, REACHNAME, ATTERCLASS, ATTERCODE, and ATTERNAME. The data is organized into a grid with 2005 rows and 6 columns. The first few rows show OBJECTID values from 2165 to 2174, KEYTOPATT values from 1000 to 810, REACHNAME values from 'Eggleston Cr-14' to 'Eggleston Cr-9', ATTERCLASS values from 'Channel Characteristics' to 'Channel Characteristics', ATTERCODE values from 'Validated' to 'Validated', and ATTERNAME values from 'Channel north Maximum width (ft)' to 'Channel north Maximum width (ft)'.

OBJECTID	KEYTOPATT	REACHNAME	ATTERCLASS	ATTERCODE	ATTERNAME
2165	1000	Eggleston Cr-14	Channel Characteristics	Validated	Channel north Maximum width (ft)
2166	548	Eggleston Cr-2	Channel Characteristics	Validated	Channel north Maximum width (ft)
2167	584	Eggleston Cr-3	Channel Characteristics	Validated	Channel north Maximum width (ft)
2168	635	Eggleston Cr-4	Channel Characteristics	Validated	Channel north Maximum width (ft)
2169	684	Eggleston Cr-5	Channel Characteristics	Validated	Channel north Maximum width (ft)
2170	725	Eggleston Cr-6	Channel Characteristics	Validated	Channel north Maximum width (ft)
2171	774	Eggleston Cr-7	Channel Characteristics	Validated	Channel north Maximum width (ft)
2172	810	Eggleston Cr-9	Channel Characteristics	Validated	Channel north Maximum width (ft)
2173	864	Eggleston Cr-8	Channel Characteristics	Validated	Channel north Maximum width (ft)
2174	9	Fifevender Cr-1	Channel Characteristics	Validated	Channel north Maximum width (ft)
2175	1854	Fifevender Cr-10	Channel Characteristics	Validated	Channel north Maximum width (ft)
2176	1889	Fifevender Cr-11	Channel Characteristics	Validated	Channel north Maximum width (ft)
2177	1844	Fifevender Cr-12	Channel Characteristics	Validated	Channel north Maximum width (ft)
2178	1889	Fifevender Cr-13	Channel Characteristics	Validated	Channel north Maximum width (ft)
2179	2075	Fifevender Cr-14	Channel Characteristics	Validated	Channel north Maximum width (ft)
2180	2124	Fifevender Cr-15	Channel Characteristics	Validated	Channel north Maximum width (ft)
2181	2160	Fifevender Cr-16	Channel Characteristics	Validated	Channel north Maximum width (ft)
2182	54	Fifevender Cr-2	Channel Characteristics	Validated	Channel north Maximum width (ft)
2183	96	Fifevender Cr-3	Channel Characteristics	Validated	Channel north Maximum width (ft)
2184	1134	Fifevender Cr-4	Channel Characteristics	Validated	Channel north Maximum width (ft)
2185	1175	Fifevender Cr-5	Channel Characteristics	Validated	Channel north Maximum width (ft)
2186	1224	Fifevender Cr-6	Channel Characteristics	Validated	Channel north Maximum width (ft)
2187	1303	Fifevender Cr-7	Channel Characteristics	Validated	Channel north Maximum width (ft)
2188	1404	Fifevender Cr-8	Channel Characteristics	Validated	Channel north Maximum width (ft)
2189	1809	Fifevender Cr-9	Channel Characteristics	Validated	Channel north Maximum width (ft)
2190	414	Fifevender Cr-1	Channel Characteristics	Validated	Channel north Maximum width (ft)
2191	459	Fifevender Cr-2	Channel Characteristics	Validated	Channel north Maximum width (ft)
2192	504	Fifevender Cr-3	Channel Characteristics	Validated	Channel north Maximum width (ft)
2193	549	Fifevender Cr-4	Channel Characteristics	Validated	Channel north Maximum width (ft)
2194	594	Fifevender Cr-5	Channel Characteristics	Validated	Channel north Maximum width (ft)
2195	639	Fifevender Cr-6	Channel Characteristics	Validated	Channel north Maximum width (ft)
2196	684	Fifevender Cr-7	Channel Characteristics	Validated	Channel north Maximum width (ft)
2197	729	Fifevender Cr-8	Channel Characteristics	Validated	Channel north Maximum width (ft)
2198	774	Fifevender Cr-9	Channel Characteristics	Validated	Channel north Maximum width (ft)
2199	819	Fifevender Cr-10	Channel Characteristics	Validated	Channel north Maximum width (ft)
2200	864	Fifevender Cr-11	Channel Characteristics	Validated	Channel north Maximum width (ft)
2201	909	Fifevender Cr-12	Channel Characteristics	Validated	Channel north Maximum width (ft)
2202	954	Fifevender Cr-13	Channel Characteristics	Validated	Channel north Maximum width (ft)
2203	1000	Fifevender Cr-14	Channel Characteristics	Validated	Channel north Maximum width (ft)
2204	1044	Fifevender Cr-15	Channel Characteristics	Validated	Channel north Maximum width (ft)
2205	1089	Fifevender Cr-16	Channel Characteristics	Validated	Channel north Maximum width (ft)

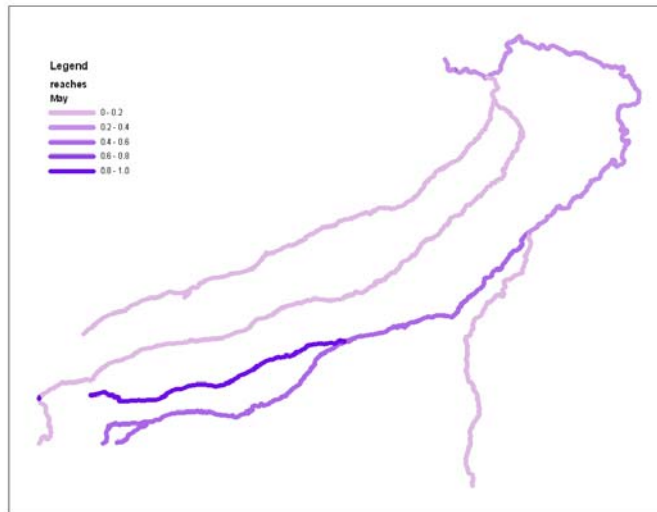
Join



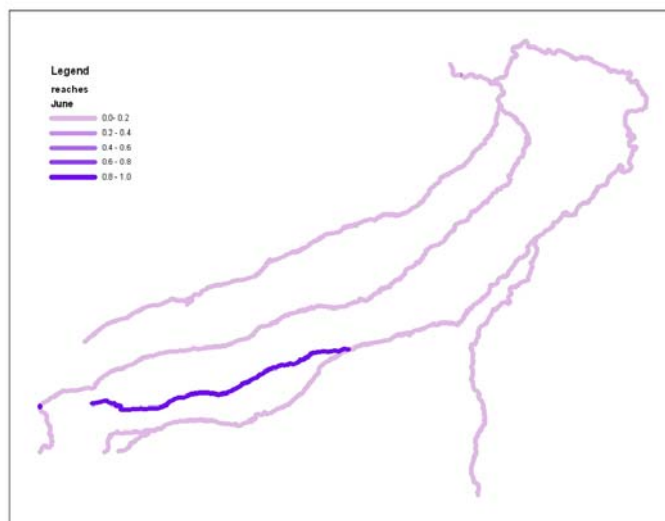
Pattern Flow High Display



Pattern Flow High Display



Pattern Flow High Display



Pattern B

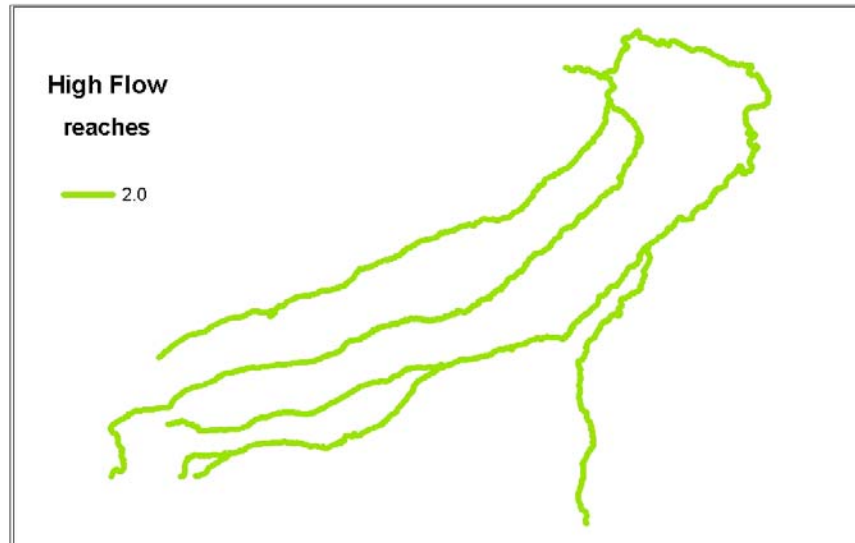
- Smaller Table
- Simple One-to-One relationship class
- Join, based on a predefined relationship class
- Shows stream velocity

Table

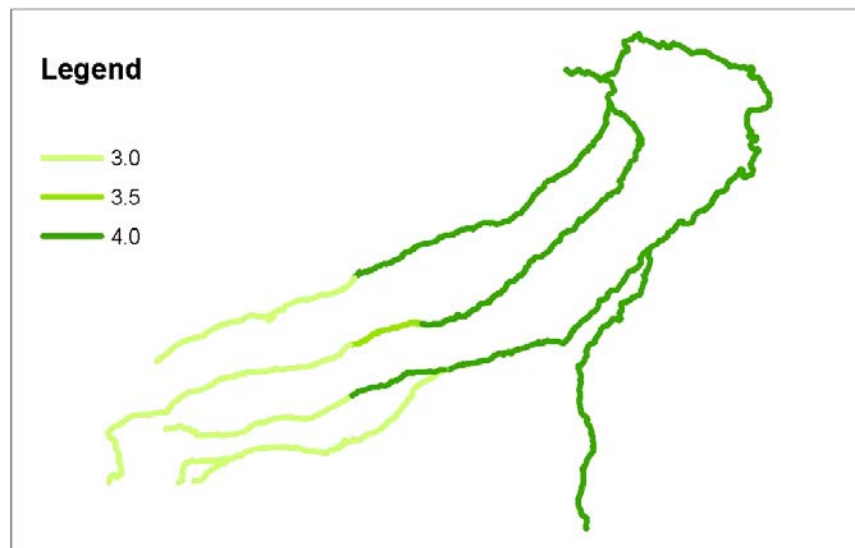
The screenshot shows the ArcCatalog application window with the 'Metadata' tab selected. The table displays metadata for a geodatabase table named 'Pattern B'. The table has the following columns: OBJECTID, REACHNAME, ATTRCLASS, ATTRCODE, ATTRVALUE, RATING, and KEYMONTH. The data is organized into rows, each representing a specific reach and its associated attributes.

OBJECTID	REACHNAME	ATTRCLASS	ATTRCODE	ATTRVALUE	RATING	KEYMONTH
22	Eightmile Cr-12	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	3.0	Mar
23	Eightmile Cr-13	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	3.0	Mar
24	Eightmile Cr-14	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	3.0	Mar
25	Fifteenmile Cr-4	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	4.0	Mar
26	Fifteenmile Cr-5	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	4.0	Mar
27	Fifteenmile Cr-6	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	4.0	Mar
28	Dry Cr-1	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	4.0	Feb
29	Dry Cr-2	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	4.0	Feb
30	Fifteenmile Cr-7	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	4.0	Feb
31	Fifteenmile Cr-8	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	4.0	Feb
32	Ramsay Cr-1	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	4.0	Feb
33	Ramsay Cr-2	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	4.0	Feb
34	Ramsay Cr-3	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	3.0	Feb
35	Ramsay Cr-4	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	3.0	Feb
36	Ramsay Cr-5	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	3.0	Feb
37	Ramsay Cr-6	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	3.0	Feb
38	Ramsay Cr-7	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	3.0	Feb
39	Ramsay Cr-8	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	3.0	Feb
40	Fifteenmile Cr-9	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	3.0	Feb
41	Fifteenmile Cr-10	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	3.0	Feb
42	Fifteenmile Cr-11	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	3.0	Feb
43	Fifteenmile Cr-12	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	3.0	Feb
44	Fifteenmile Cr-13	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	3.0	Feb
45	Cedar Cr	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	3.0	Feb
46	Fifteenmile Cr-14	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	3.0	Feb
47	Fifteenmile Cr-15	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	3.0	Feb
48	Fifteenmile Cr-16	Flow Attributes	FlowHigh	Flow - change in interannual variability in high	3.0	Feb

Fifteen Mile Subbasin:
Historic High Flow Rate



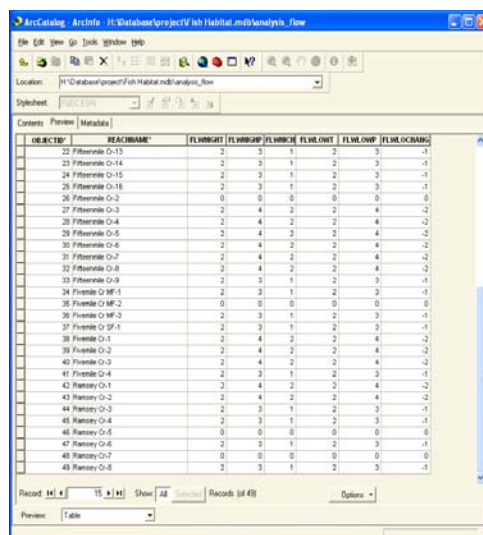
Fifteen Mile Subbasin:
Current High Flow Rate



Analysis Flow

- Even Smaller Table
- Flow change between current and historic rate of flow

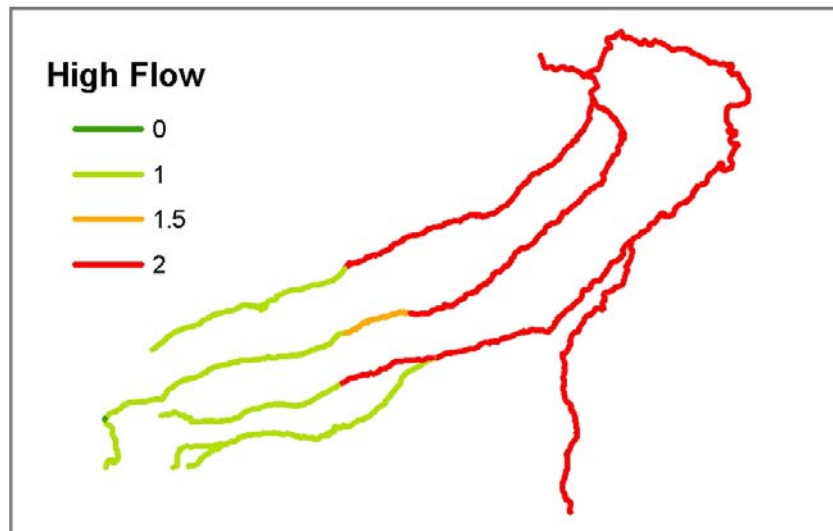
Table



The screenshot shows the ArcCatalog interface with a table named 'analysis_flow' open. The table has the following columns: OBJECTID, REACHNAME, FLOWRATE1, FLOWRATE2, FLOWRATE3, FLOWRATE4, FLOWRATE5, FLOWRATE6, and FLOWRATE7. The data is organized into rows, with each row representing a specific reach and its corresponding flow rates. The table is displayed in a grid format with a scroll bar on the right side.

OBJECTID	REACHNAME	FLOWRATE1	FLOWRATE2	FLOWRATE3	FLOWRATE4	FLOWRATE5	FLOWRATE6	FLOWRATE7
22	Filtherville O-13	2	3	1	2	3	3	-1
23	Filtherville O-14	2	3	1	2	3	3	-1
24	Filtherville O-15	2	3	1	2	3	3	-1
25	Filtherville O-16	2	3	1	2	3	3	-1
26	Filtherville O-17	0	0	0	0	0	0	0
27	Filtherville O-18	2	4	2	2	4	4	-2
28	Filtherville O-19	2	4	2	2	4	4	-2
29	Filtherville O-20	2	4	2	2	4	4	-2
30	Filtherville O-21	2	4	2	2	4	4	-2
31	Filtherville O-22	2	4	2	2	4	4	-2
32	Filtherville O-23	2	4	2	2	4	4	-2
33	Filtherville O-24	2	3	1	2	3	3	-1
34	Filtherville O-25	2	3	1	2	3	3	-1
35	Filtherville O-26	0	0	0	0	0	0	0
36	Filtherville O-27	2	3	1	2	3	3	-1
37	Filtherville O-28	2	3	1	2	3	3	-1
38	Filtherville O-29	2	4	2	2	4	4	-2
39	Filtherville O-30	2	4	2	2	4	4	-2
40	Filtherville O-31	2	4	2	2	4	4	-2
41	Filtherville O-32	2	4	2	2	4	4	-2
42	Filtherville O-33	2	3	1	2	3	3	-1
43	Filtherville O-34	2	4	2	2	4	4	-2
44	Filtherville O-35	2	4	2	2	4	4	-2
45	Filtherville O-36	2	3	1	2	3	3	-1
46	Filtherville O-37	0	0	0	0	0	0	0
47	Filtherville O-38	2	3	1	2	3	3	-1
48	Filtherville O-39	0	0	0	0	0	0	0
49	Filtherville O-40	2	3	1	2	3	3	-1

Fifteen Mile Subbasin:
Change of High Flow Rate



Pattern C

- Pattern ID numbers (from original table) and spatial data create a relationship class
- Pattern ID lookup table
- Join and Join

Table

The left screenshot shows the 'Contents' pane of ArcCatalog. It lists various pattern lookups with their respective pattern IDs and values. The right screenshot shows the 'Metadata' pane for the 'patternlookup_C' table, displaying a detailed table of data.

OBJECTID	PATTERN_ID	PATTERN_NAME	JAN
1	0	No Variation	1
2	1	15 mile average flow	0.11
3	81	Temp max #1	0
4	89	Lower 15 FlowHigh	0.22
5	90	Upper 15 FlowHigh	0.43
6	91	5 mile FlowHigh	0.05
7	92	5 mile FlowHigh	0.21
8	94	Dry FlowHigh	0.29
9	95	Remotely FlowHigh	0.35
10	97	Lower 15 mile FlowLow	0
11	98	Upper 15 mile FlowLow	0
12	99	5 mile FlowLow	0
13	100	5 mile FlowLow	0
14	102	Dry Creek FlowLow	0
15	104	Remotely FlowLow	0
16	105	15 mile Withdrawal	0.03
17	106	15 mile average flow	0.11
18	107	Temp min	1
19	108	Max temp	0
20	109	Predation	0.3

OBJECTID	BEACHNAME	BESCORE1	BESCORE2	BESCORE3	BESCORE4	FLWDELVAR	FLWDELVAR	FLWDELVAR	FLWDELVAR
1	Creek O-1	90	90	61	61	0	0	90	
2	Dry O-1	90	90	61	61	0	0	90	
3	Dry O-2	90	90	61	61	0	0	90	
4	Eightmile O-1	91	91	61	61	0	0	90	
5	Eightmile O-10	91	91	61	61	0	0	90	
6	Eightmile O-11	0	0	0	0	0	0	90	
7	Eightmile O-12	91	91	61	61	0	0	90	
8	Eightmile O-13	0	0	0	0	0	0	90	
9	Eightmile O-14	91	91	61	61	0	0	90	
10	Eightmile O-2	91	91	61	61	0	0	90	
11	Eightmile O-3	91	91	61	61	0	0	90	
12	Eightmile O-4	91	91	61	61	0	0	90	
13	Eightmile O-5	91	91	61	61	0	0	90	
14	Eightmile O-6	91	91	61	61	0	0	90	
15	Eightmile O-7	91	91	61	61	0	0	90	
16	Eightmile O-8	91	91	61	61	0	0	90	
17	Eightmile O-9	91	91	61	61	0	0	90	
18	Eightmile O-1	89	89	61	61	0	0	90	
19	Eightmile O-10	90	90	61	61	0	0	90	
20	Eightmile O-11	90	90	61	61	0	0	90	
21	Eightmile O-12	90	90	61	61	0	0	90	
22	Eightmile O-13	90	90	61	61	0	0	90	
23	Eightmile O-14	90	90	61	61	0	0	90	
24	Eightmile O-15	90	90	61	61	0	0	90	
25	Eightmile O-16	90	90	61	61	0	0	90	
26	Eightmile O-2	0	0	0	0	0	0	90	
27	Eightmile O-3	89	89	61	61	0	0	90	
28	Eightmile O-4	89	89	61	61	0	0	90	

Second Join

Join Data

Join lets you append additional data to this layer's attribute table so you can, for example, symbolize the layer's features using this data.

What do you want to join to this layer?

Join attributes from a table

1. Choose the field in this layer that the join will be based on:

pattern_C.FLWHIGHHP

2. Choose the table to join to this layer, or load the table from disk:

patternlookup_C

☒ Show the attribute tables of layers in this list

3. Choose the field in the table to base the join on:

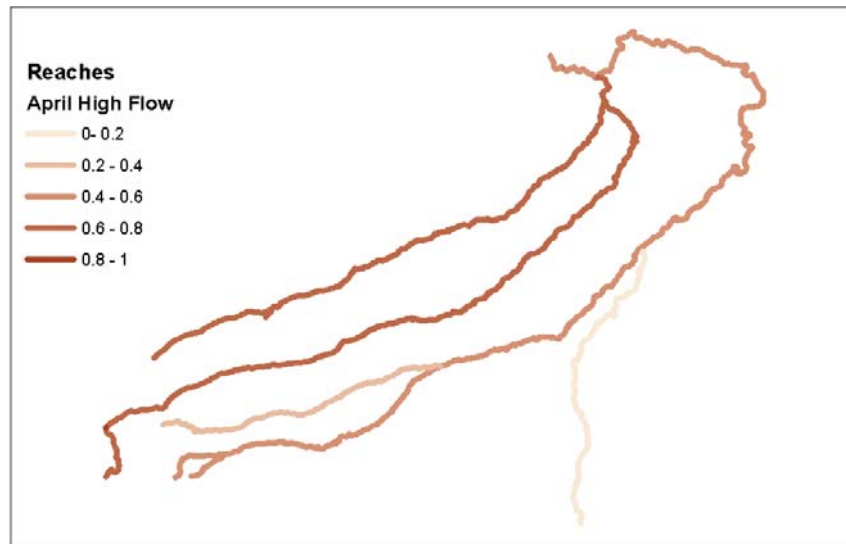
PATTERN_ID

Advanced...

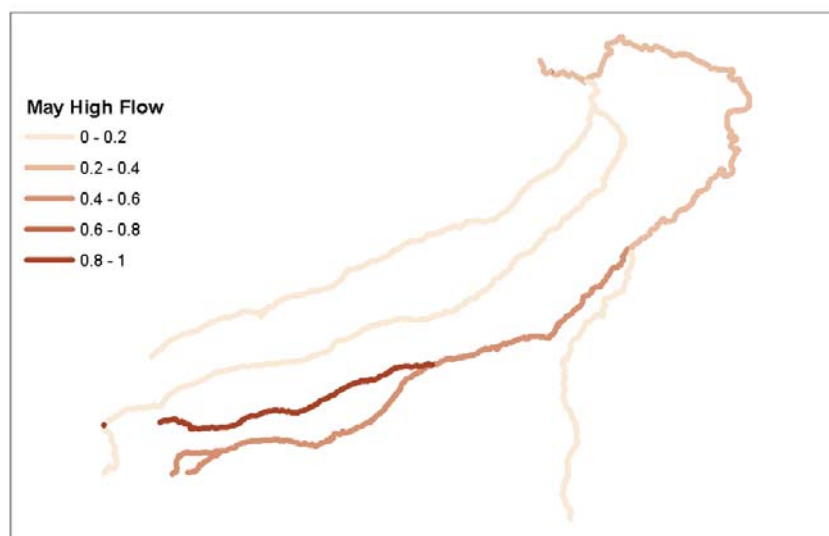
About Joining Data

OK Cancel

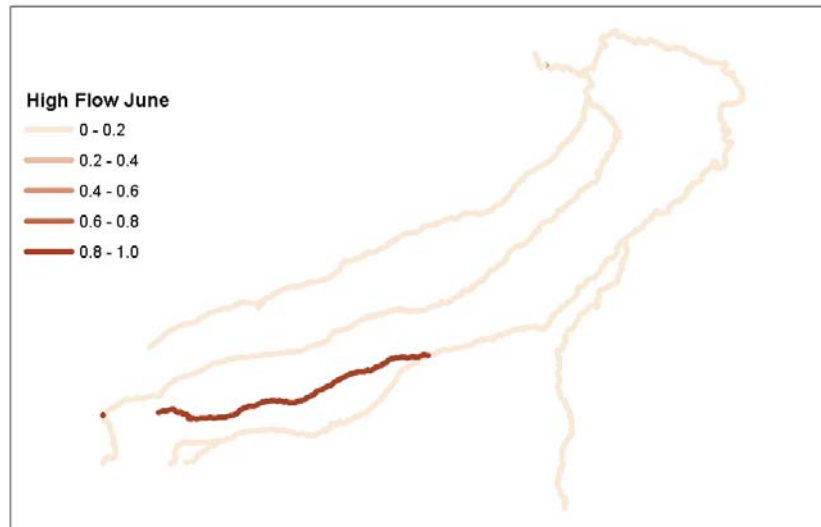
Fifteen Mile Subbasin:
April Current High Flow



Fifteen Mile Subbasin:
May Current High Flow



Fifteen Mile Subbasin: June Current High Flow



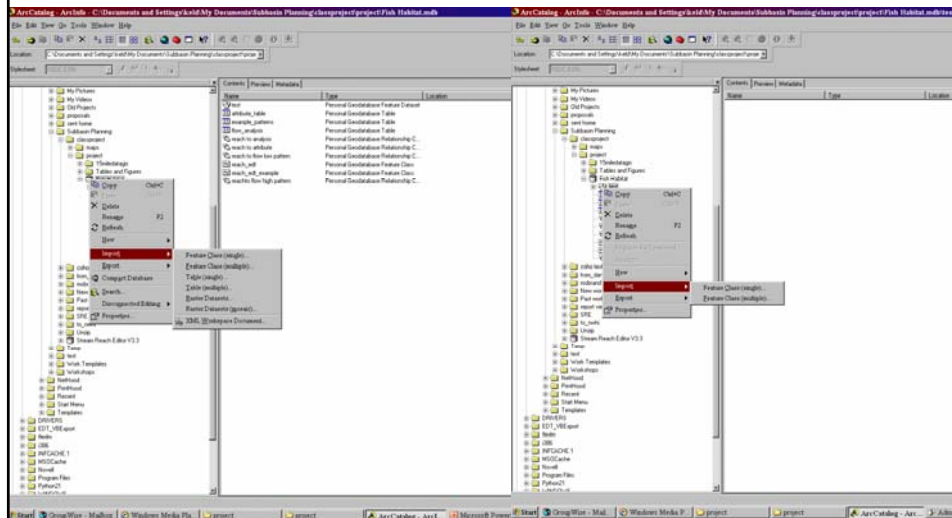
Troubles

Relationship class – use the relationship between a spatial dataset and a dBASE table of attributes to symbolize and map the attributes with a relate.

ESRI confirms that there's no way to define map symbology with fields in a relationship class.

Future ArcMap release. For now we used a join.

Troubles



- A feature dataset will not allow you to import a dBASE table.

Troubles

- Does not import with the shapefile or dBASE table into a geodatabase.
- Can use the import button on the metadata page.

Conclusions

- Not worth the work for pattern data
- Relationship class did not work how we planned.
- If ESRI changed to a relate with a relationship class it may make it feasible.
- Relationship class does help to organize tables and quickly create a join.
- BUT: users must be very familiar with Data