Exercise 2: Building a Watershed Base Map

Solution

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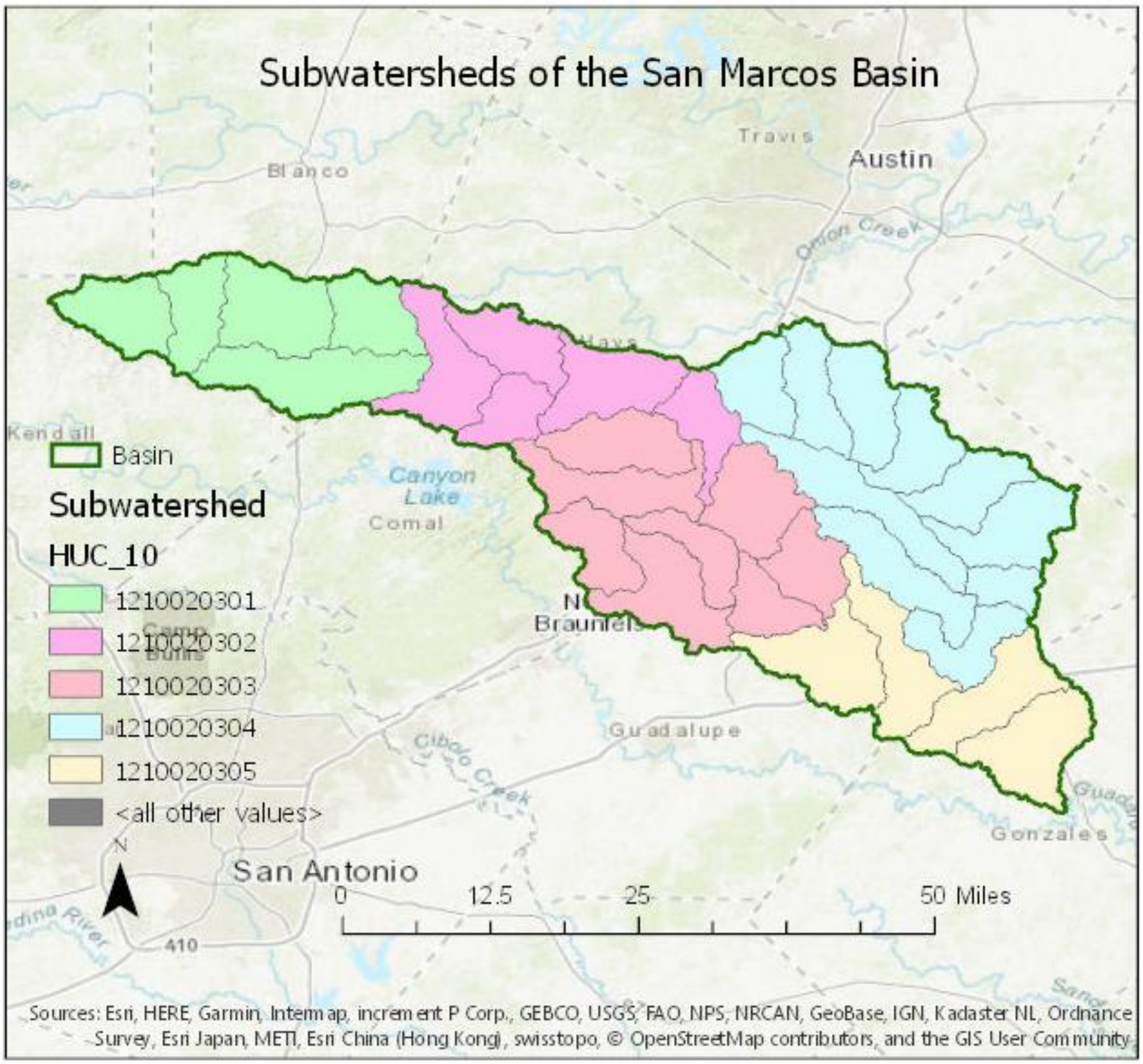
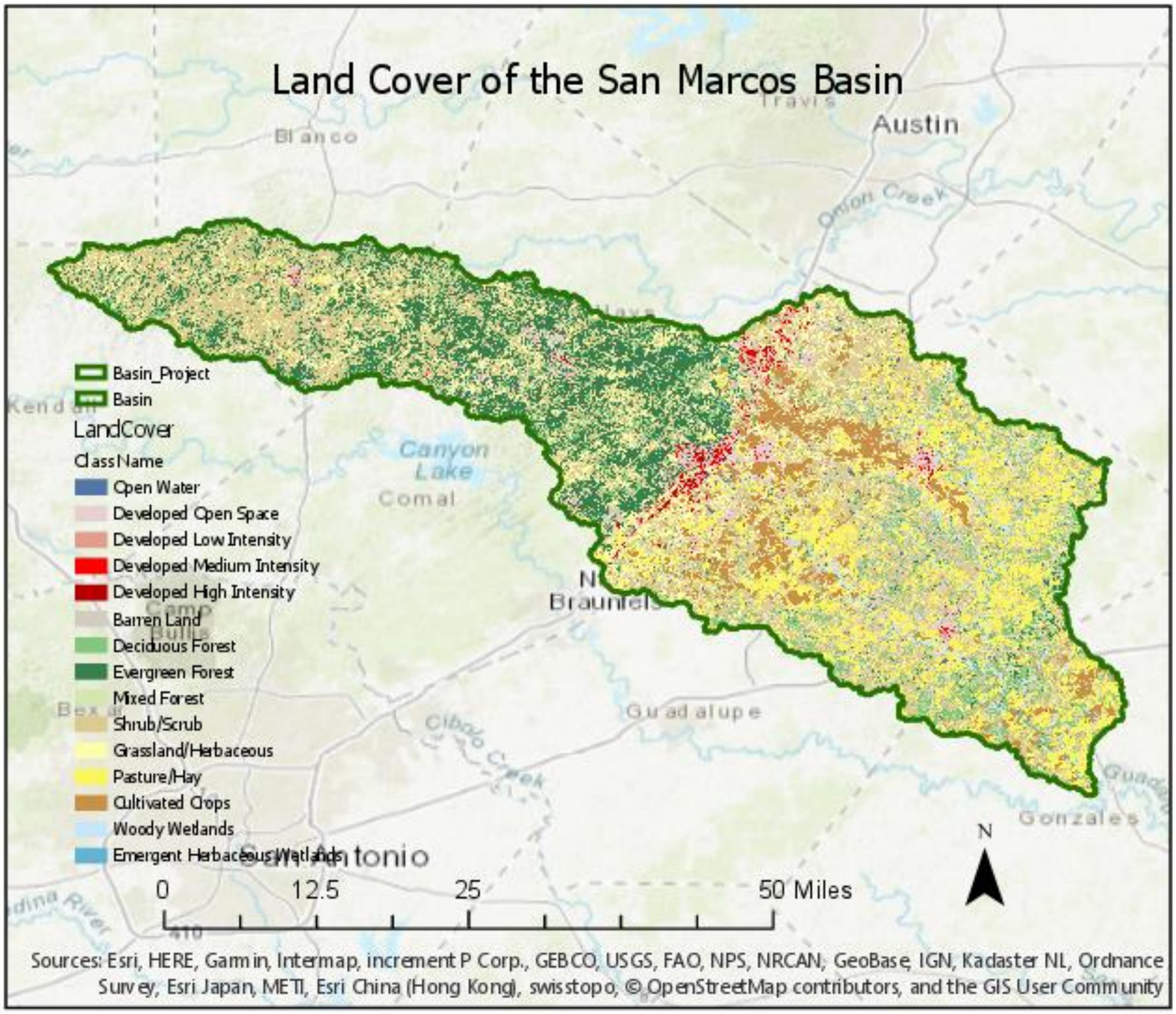
Question 1:*Make a map of the San Marcos basin with its HUC10 and HUC12 watersheds and subwatersheds. Use a layout as you learned in exercise 1. How many HUC10 and HUC12 units exist in the San Marcos Basin? Note that maps that you turn in should be clearly labeled so that they may be unambiguously interpreted with a title, scale, north arrow and appropriate legend information.*

Solution:
There are **5 HUC 10** Watersheds in the San Marcos Basin, indicated by the shaded colors in the map, and in the map legend. Within these, there are **32 HUC 12** Subwatersheds of the San Marcos Basin, indicated by the individual feature polygons within the basin boundary.



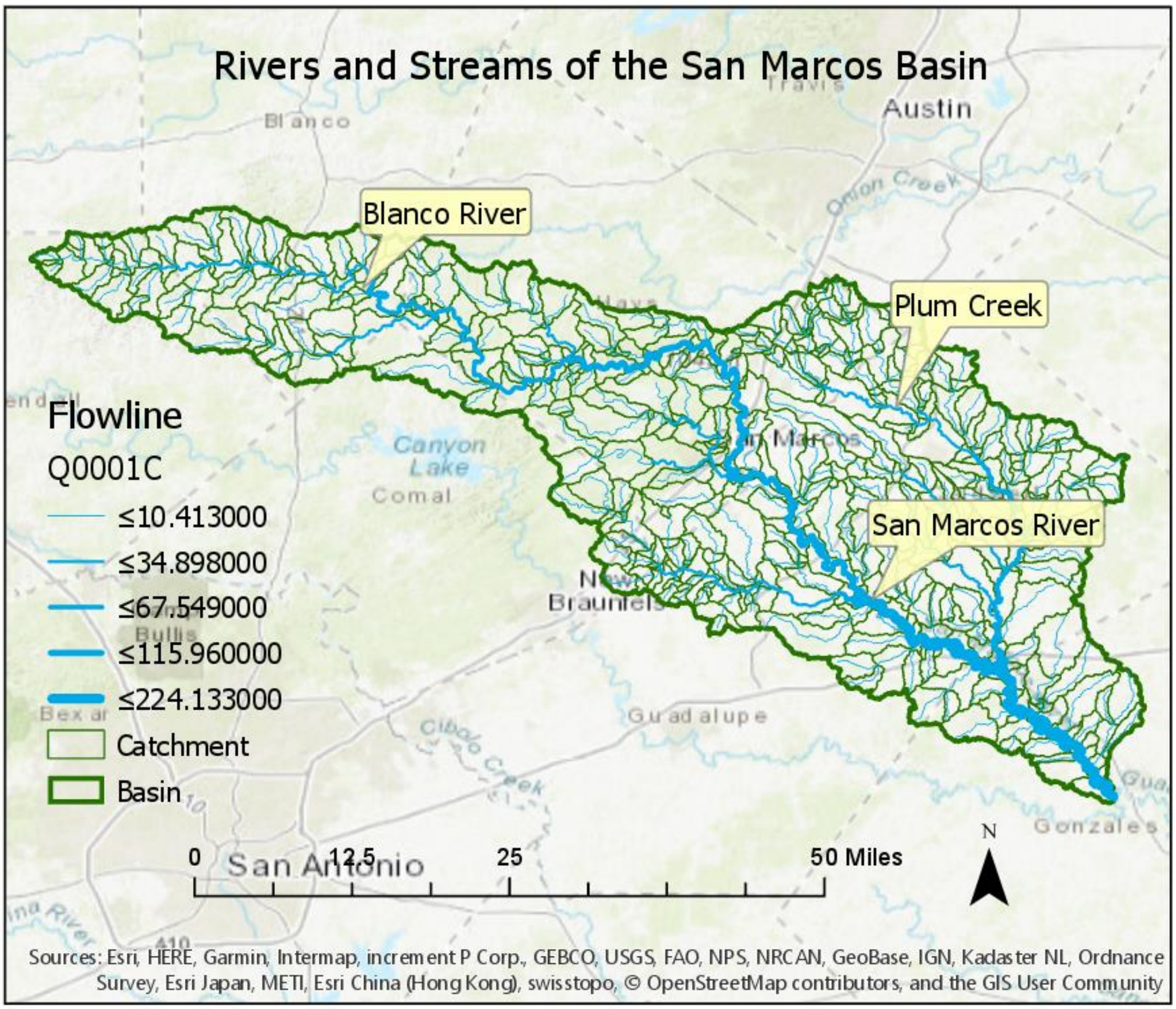
Question 2: *Make a map of the land cover over the San Marcos Basin. Prepare a table that shows the area (km^2) of each of the main land cover classes and the % of the total basin area that each land cover class represents.*



OBJECTID	MainClass	FREQUENCY	SUM_Count	Area (Km2)	% of Total
1	Barren	1	9081	**8.17**	**0.2**
2	Developed	4	373724	**336.35**	**9.6**
3	Forest	3	994869	**895.38**	**25.4**
4	Herbaceous	1	460953	**414.86**	**11.8**
5	Planted/Cultivated	2	766392	**689.75**	**19.6**
6	Shrubland	1	1215578	**1094.02**	**31.1**
7	Water	1	17291	**15.56**	**0.4**
8	Wetlands	2	73106	**65.80**	**1.9**
	Total		3910994	**3519.89**	**100**
	Cell Size	30			

The map on p.2 shows the land cover in the Albers coordinate system. I exported the MainClass statistics table to Excel and added the Area (Km^2) and % of Total data in Excel. I projected the Basin feature class to the same coordinate system and checked its area 3519.9 Km^2 is consistent with land cover data. To get the Area Km2 values I took Count * (30x30) / 1000000. For example, for Barren land, Count = 9081 cells, and each cell is 30x30m = 900 m2. Hence Barren land covers 9081*900 = 8172900 m2, or 8172900/1000000 Km2 = 8.17 Km2, as shown in the table. I totaled up these Area (Km2) values and found the result 3519.9 Km2 to be consistent with the total basin area 3520.0 Km2 from the Basin feature class.

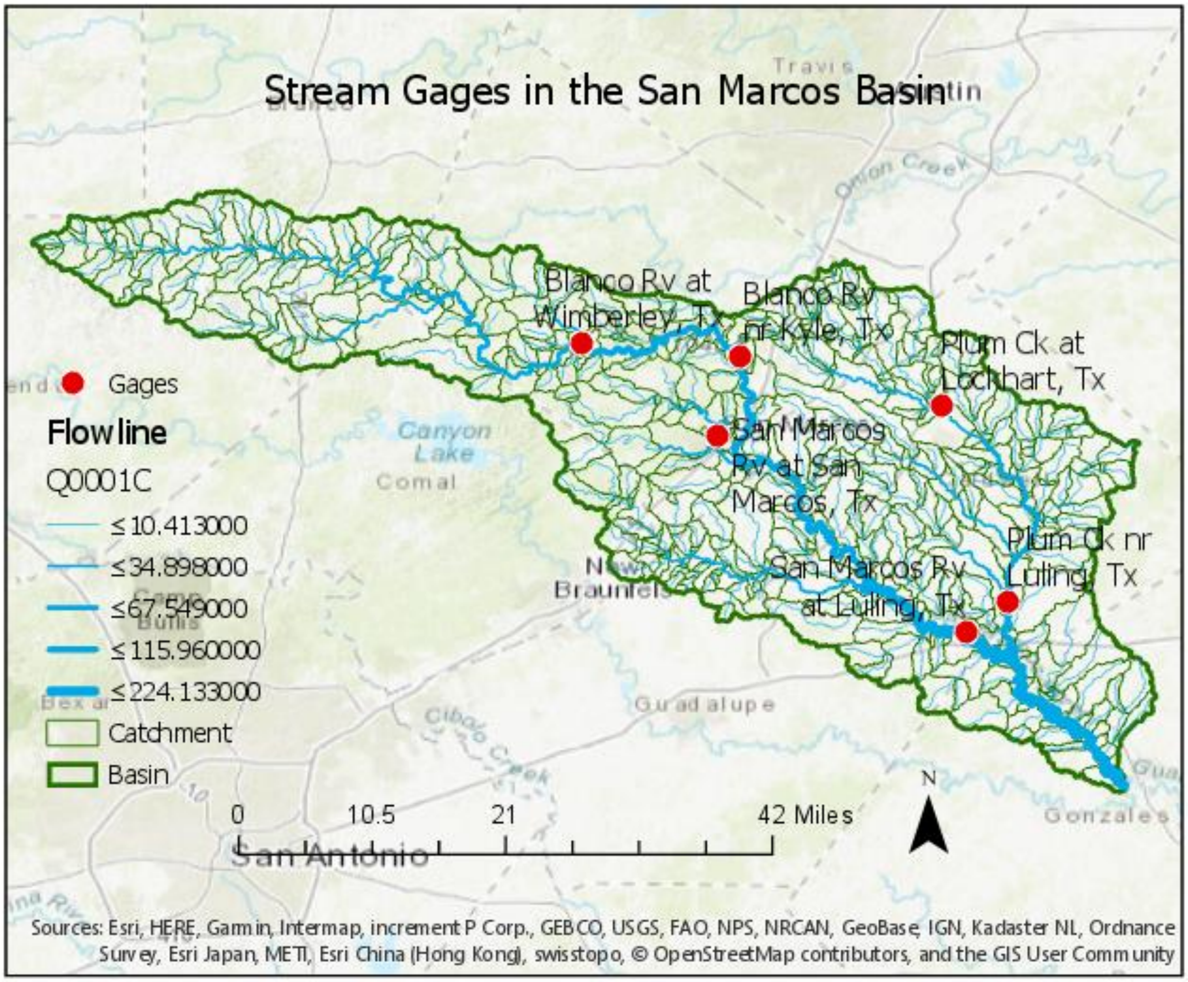
Question 3: *Make a map of the San Marcos basin with its labeled rivers. How many Catchments lie within this basin? What is their average area (Sq. Km)? How many Flowlines lie within this basin? What is their average length (Km)*



Summarizing the statistics of the AreaSqKm attribute of the Catchment feature class, shows that there are **555 catchments** whose average area is **6.34 Km^2**. As a check, the Sum of these catchment areas is found to be 3520.0 Km^2, which is consistent with the results obtained earlier.

Similarly, summarizing the statistics of the LengthKm attribute of the Flowline feature class yields **557 flowlines** with an average length of **3.39 Km**. You'll notice that there are slightly more flowlines than catchments in this basin and that occurs in the development of the NHDPlus dataset when a flowline is so short that a catchment cannot be drawn around it.

Question 4: *A layout showing a map and table describing the flow gages in the San Marcos Basin*



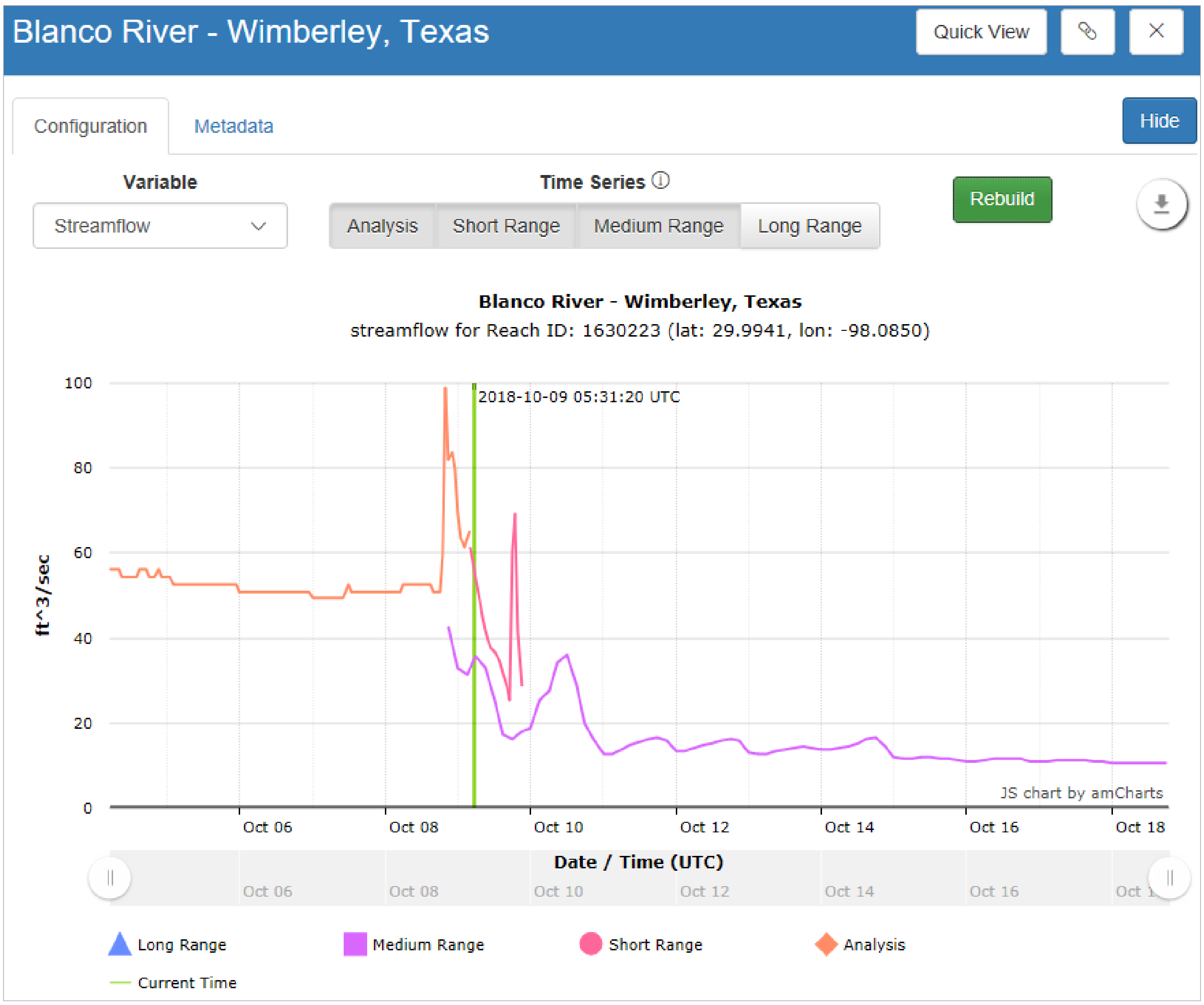
GageNo	SiteID	SiteName	Latitude	Longitude	LatDD	LongDD	DASqMile	MAFlow
6	08171000	Blanco Rv at Wimberley, Tx	29° 59' 39"	98° 05' 19"	29.994167	-98.088611	355	142
5	08171300	Blanco Rv nr Kyle, Tx	29° 58' 45"	97° 54' 35"	29.979167	-97.909722	412	165
4	08172400	Plum Ck at Lockhart, Tx	29° 55' 22"	97° 40' 44"	29.922778	-97.678889	112	49
2	08173000	Plum Ck nr Luling, Tx	29° 41' 58"	97° 36' 12"	29.699444	-97.603333	309	114
3	08172000	San Marcos Rv at Luling, Tx	29° 39' 58"	97° 39' 02"	29.666111	-97.650556	838	408
1	08170500	San Marcos Rv at San Marcos, Tx	29° 53' 20"	97° 56' 02"	29.888889	-97.933889	48.9	176

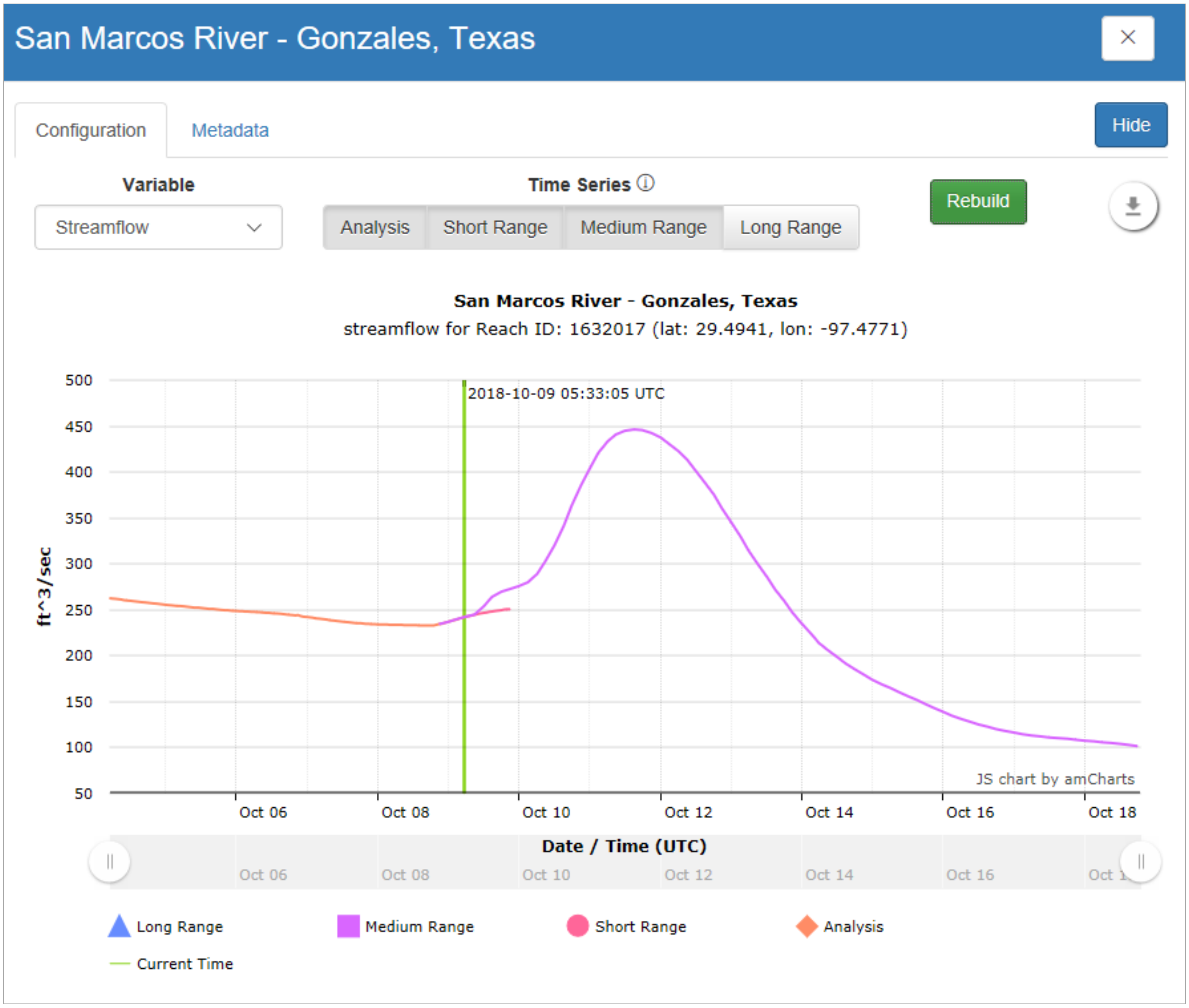
The layout shown above has a table included in it for the gages in which some fields have been omitted so that the remainder can be displayed in one page width. There is a procedure to add a table to a layout using the Contents pane on the left side of the Layout display. Its an obscure process, however, so if you just screen capture your attribute table and put it here, that is ok.

***Question 5:** Screen captures of your National Water Model forecasts of the Blanco River at Wimberley and the San Marcos River. What is the approximate ratio of the forecast flows at the two locations? How does this compare to the ratio of their drainage areas? Use the attribute TotDASqKM on the Flowline feature class to find the drainage areas of these two flowlines.*

	Drainage Area (Km^2)	**Current Discharge (cfs)**
Blanco at Wimberley	922.0	60
San Marcos at Gonzales	3520.0	240

The **ratio of the two drainage areas = 3520/922 = 3.8.** The ratio of the **two current flows, as of 1 AM on 9 October = 240/60 = 4.0**. Hence the flows are approximately consistent with the drainage area. These ratios would vary if there was a flood in the basin.




San Marcos River - Gonzales, Texas
Configuration
Metadata
Hide
Variable
Streamflow
Time Series
Analysis
Short Range
Medium Range
Long Range
Rebuild
San Marcos River - Gonzales, Texas
streamflow for Reach ID: 1632017 (lat: 29.4941, lon: -97.4771)
2018-10-09 05:33:05 UTC
ft^3/sec
500
450
400
350
300
250
200
150
100
50
Oct 06
Oct 08
Oct 10
Oct 12
Oct 14
Oct 16
Oct 18
JS chart by amCharts
Date / Time (UTC)
Long Range
Medium Range
Short Range
Analysis
Current Time