**2106 Flow Data Findings – Work in Progress #2 – jb**

**Last Saved 7/9/17**

Continuing with the Boxelder gage’s greatest percentage flow changes as reported in a table in the last write-up – and after having to relearn how best to manage, display and document the data we have.

**Remember** that we do not have any data for locations between the Lincoln gage and the Boxelder gage. Diversions in this reach are Timnath Inlet, Boxelder Ditch, and the Fossil Creek Inlet.

**1. Declining Events**

a. Boxelder Gage Declining Flow, Tuesday, March 1, 2016



This looks to be a straightforward water rights situation, at least within the confines of the data we have. Boxelder gage is running along until Little Cache turns on. This diversion, and perhaps others, takes about half of the Lincoln gage and essentially all of the Boxelder gage, even as the Canyon gage eventually adds some flow. Hansen Supply is “leaking” less than 3 cfs the whole time and not playing any role.

b. Boxelder Gage Declining Flow, Monday, July 4, 2016



Once again, this appears to be a straightforward water rights situation. Larimer-Weld stair-steps up its diversion, curtailing both Lincoln and Boxelder gages, the latter dropping to about 2 cfs. As stated above, we do not know if some other diversions were in the mix. (Note that I had to delete the Canyon gage to be able to display this graph in any meaningful sense.)

c. Boxelder Gage Declining Flow, Sunday, July 31, 2016



In this case, it would appear that Boxelder gage took two steep plunges, first from ramping up Larimer County and then again from increasing the Larimer-Weld diversion. Increases at Hansen and to a lesser extent the Canyon caused a brief rally at Boxelder gage (and Lincoln) but ultimately failed to offset the collective upstream diversions.

d. Boxelder Gage Declining Flow, Thursday, September 1, 2016



Looks like demand for irrigation fell off generally over about 2 days in total, starting with an early morning shut-off at Hansen. Boxelder gage fell from about 170 to 30 cfs in one day.

e. Boxelder Gage Declining & Rising Flow, Sunday, September 25, 2016



This appears to be an overall low flow situation where, though Hansen releases dominate the river, Larimer-Weld, and most all the other diverters, are likely exhausting the inputs. It is not clear why Lincoln and Boxelder gages exhibit a rise before the fall. Perhaps demands far downstream, which I did not examine, consumed the initial Hansen releases which began at about 7 am and did not accrue at Lincoln until about 3:30 pm. Larimer-Weld began diverting at about 9 pm. That is, there seems to be no “close” timing issue. It does, however, seem a bit odd that Larimer-Weld began diverting so late in the day.

f. Boxelder Gage Declining Flow, Saturday, October 15, 2016



This late season situation is not obvious. It must be that the one or more of the diversions we don’t have data for has essentially swept the river such that what appears at Boxelder gage (2.2. cfs) is made up of solely of small accretions.

**2. Increasing Events**

Lots of uncertainty here, again because of missing data. And, I don’t know about you, but my eyes are starting to cross from trying to make sense of too many of these graphs ☺

a. Boxelder Gage Increasing Flow, Friday, January 1, 2016



The spike at Boxelder gage actually happened on January 2 as measured from the low point on January 1. The Canyon gage must have been frozen as it read zero flow. Perhaps one of the diversion structures below Lincoln needed to be cleared of ice or became partially plugged with ice for a short time?

b. Boxelder Gage Increasing Flow, Friday, February 26, 2016



Kind of the same story, I suppose. One or more of the diversions between the Lincoln and Boxelder gages must have greatly reduced its diversion starting at about 10 am.

c. Boxelder Gage Increasing Flow, Friday, March 18, 2016



Looks like the initiation of irrigation season is generating flux. The North Poudre canal turns off just before Seaman begins to release. At least one diversion between the Lincoln and Boxelder gages turns off such that Boxelder gage mimics the diurnal trend at Lincoln. Then yet another intermediate diversion turns off or greatly reduces. Kind of interesting that the Boxelder gage exceeds the Lincoln gage by about 6 cfs at least for a short time. A question: do most of the smaller diversions turn on and off, or do they adjust the volume of diversion, or is it some of both?

d. Boxelder Gage Increasing Flow, Sunday, July 8, 2016



Boxelder gage rebounds paralleling the Lincoln Gage as at least Larimer-Weld and to a minor degree Larimer County throttle back. Hansen Supply bumps up also. Must be a demand further downstream.

e. Boxelder Gage Increasing Flow, Friday, July 15, 2016



Lincoln and Boxelder gages pick up a brief spike due to a mismatch in synching Hansen Supply input and Larimer-Weld diversion.

f. Boxelder Gage Increasing Flow, Tuesday, August 2, 2016



Unclear what factors may have combined to increase Boxelder gage flows.

g. Boxelder Gage Increasing Flow, Sunday, September 25, 2016

**NOTE: Already covered as declining & rising, above.**