Documentation of updates to FFC QA

Based on request by Greg P. to modify wet season start timing to occur earlier (e.g., not on steep part of pulse) in snowmelt-type streams

Steps:

~ 3/25: re-run FFC after modifying wet season start timing, to output updated FFC result matrices

4/7: Realize code for obtaining highflow strings from FFC is lost… but highflows and their timing has not changed, so develop a method to extract highflow strings from old datasets and insert into updated FFC results matrices (convert\_highflows.py).

Update code to account for slight differences in updated results files (necessary only for two calculations that use highflow values, rainearlySpring.py and rainLateWet.py), and some improvements to make code more robust to diff data types (strings vs None vs Nan).

Calculations that had differences after results were compiled and averaged – and why:

SpBflLag - % years when number days between spring and dry is greater than 150 days. Did not expect change.

snowEarlySpring - % water years in which spring occurs before Jan 15. Ugh did not expect a difference here either. Is this something about water years?

snowEarlyWet - % of water years in which the start of wet season occurs before March 1st, out of all total water years. Makes sense that it would change, but now it’s so high – from 24% up to 59%! Can that really be true? Look at data bands and see. Uhm yep, makes sense. Need to question March 1st threshold.

snowSpringBfl - Percentage of water years in which spring recession timing and baseflow timing occur within 45 days of each other. Did not expect change … but went down 26% to 17%.

LSRspringBfl - Percentage of water years in which spring recession timing and baseflow timing occur within 30 days of each other. Also did not expect change… slight reduction.

LSRspringBflRate – changed because LSRspringBfl changed.

rainWetSpring - Percentage of water years in which wet season high flows timing and spring recession timing occur within 30 days of each other. Change expected, but slight since rain timings not expected to change too much (and yes, timing change was slight).

rainEarlySpring - Percentage of the water year’s total high flow events that occur after the spring recession timing in each year. Would not expect change unless spring timing changed… and value now jumped up very high, from 3% to 35% ☹

rainLateWet - Percentage of the water year’s total high flow events that occur before the wet season timing in each year. Yes makes sense to have change. From 1% to 7%.

So, did spring timing change too??!!

Answer is yes. Not quite sure when & where it happened, but good thing I’m redoing the analysis…

Upon looking at rainEarlySpring, something must be wrong… visually inspecting WS streams, where perc. Is supposedly 42%, looks like it should be near zero… need to troubleshoot.

Conclusion after a few hours: there are some irreparable errors with the convoluted string-extraction method for highflows QA. Need to start over, with extracting highflow data from FFC. Also rethinking metrics definitions. Think it may be better to not count perc. Of highflows in each year, but only mark the first or last one, and whether or not it’s before/after timing of interest.

Overhauled FFCQA highflows to only use first or last highflow value. 100x easier than what I was doing before. All highflow info pulled right out of FFC is in offset, of course.

Notes on Tukey’s boxplot analysis based on output timing metrics.

Trying stuff out per Sarah Y’s request to look into why WSI boxplots are all considered significant. Try another analysis and see what happens. (Belle says just try one other)

Tried re-running Tukey’s with both 90% confidence, and 99% confidence. Same results for all timings across the board.

Took a step back and ran Levene’s test, which tests if the variances of the populations from which samples are drawn can be assumed equal. (This equal variance is an underlying assumption of ANOVA). So if the results come back with p<0.05 (signaling sig diff), means the variance IS equal and I should not be using ANOVA. Which I have been this whole time… ><

Wikipedia says I should switch to a more generalized test, or maybe a non parametric test.. maybe Welch’s t-test. But still pretty inconclusive based on internet searches, some sources think large samples are fine to use with ANOVA, or if large samples appear normal, then go with it.

Tried Kruskal-Wallis test with Dunn test for multiple comparisons as a post-hoc, with p-vals adjusted using the Holm method. Results kinda funky. In some of the timing results, snowmelt and rain (the obviously most different) had a p-val of 0, while the others had p-vals lower. But the WSI result was same as Tukey’s, with no significance between rain/sm and rain, but sig between snowmelt and the others.