Upper and Middle Suwannee River MFL Peer Review

Initial Peer Review Comments for Meeting 2
Scheduled for April 19th at 1pm

Dr. Gregg Jones
Comments and Questions

Received on 4/7/2023

1) Reference Time Frame River Flows - USR and MSR

I have questions for the development of the reference time frame flows for the river gauges. Looking at the appendices for the USR and MSR reports, it appears RTF river flows were determined using the same methodology for both river segments, correct?

I believe the panel was instructed not to comment on anything related to the NFSEG model since it was extensively peer reviewed. However, I need to understand the level of uncertainty in the RTF river flow calculations.

USR report - Period of Record for groundwater level data - there are 17 Floridan aquifer monitor wells. The POR for 13 of them starts in 1976 or later. The earliest record begins in 1948. The next earliest is 1959, then 1961, and 1963.

For the MSR report, there are only 6 wells used. The earliest groundwater level POR starts in 1976. The earliest POR for the remaining 5 wells is 1981 and the POR for the rest begins considerably later.

I assume historic groundwater levels for the Floridan aquifer System (FAS) in the MSR and USR areas for the NFSEG model were developed using data from these wells because it is the best available data.

USR Appendix C page C-2 paragraph 3 states: *The groundwater withdrawals required for the development of RTFs were estimated on a yearly basis for each county in the NFSEG model domain (Figure 1) for calendar-years 1900-2015. A subset of these estimates were then used to evaluate changes in groundwater levels and flows in response to changes in groundwater use from 1928 through 2015 – the maximum period of continuous hydrologic record available for long-term analysis on the Upper Suwannee River.*

There was no groundwater level data for the FAS for both the USR and MSR regions prior to 1948 and only very minimal data from 1959 through 1976. How was it possible to calculate a valid synthetic groundwater hydrograph prior to 1976? These synthetic groundwater hydrographs were used in the NFSEG model to adjust the historic flows at all the MFL river gauges from 1928 through 2015. Based on this analysis, I am concerned about the level of error in the RTF flows for the river gauges, especially for the 48 years prior to 1976.

2) Reference Timeframe River Flows

I believe I understand why the District has used the RTF River flows exclusively for all the analyses in the report. As I go through all the analyses that were done, I have to constantly remind myself that the RTF flows are not the actual flows in the river. The fact that none of the analyses are ever related to back to actual historic flows in the river impedes my ability to truly grasp what is happening in the river. While I am not necessarily recommending the District include such analyses, I think there needs to be an explanation in the reports as to why the District has chosen this approach.

3) Atlantic Multi-Decadal Oscillation

Page 35 paragraph 1 of the MSR report states that: *Streamflow LOESS trends for the two compliance gages appear to be higher during the cooler AMO period and lower during the warmer AMO periods. The long period of analysis for the MSR gages covers multiple AMO cycles; therefore, the FDC used in MFL analyses takes into account the multidecadal variability of rainfall, temperature, and streamflow.*

The use of the term "appears" is very subjective. Recommend statistical significance be determined.

4) Mikel Clifton Well Data

Page 38 Figure 2-27 – Mikel Clifton groundwater well data is supposed to start in 1977 but it appears the graph contains no data prior to about 1982.

5) Figure 2-28

Page 39, Figure 2-28 MSR Report. Caption to this figure says *"Annual Water Level"* but each individual graph refers to it as annual average. I assume it is annual average?

Is construction information provided for any of these wells (total depth, cased depth, etc)?

6) Shallow Monitor Wells

Page 39 – Paragraph 1 MSR Report states: *The second groundwater data source includes 20 shallow monitoring wells established throughout the MSR floodplain to assess floodplain hydroperiods for a single annual period (November 2013 through November 2014) (Figure 2-21). Floodplain well data were examined in concert with 16 surface water staff gages, also described in more detail in Appendix V. The monitoring well and concurrent USGS streamflow data confirmed statistically significant hydroperiod differences among wetland types in the floodplain, and added direct weight of evidence that fairly frequent floods (those occurring at least once every five years rising well-above the groundwater table are important drivers in existing plant community distributions.*

If the wells were only monitored for 1 year, how did they provide useful information for floods that occur once every 5 years?

7) RTF Adjustment Factors for Springs

Page 40, last paragraph states: *RTF adjustment factors were also determined for a select number of priority springs and groundwater wells. The largest flow adjustment factor is at Troy Springs, with a peak adjustment of approximately 2.9 cfs in 2002* (Figure 2-32, page 42).

I want to be certain I am interpreting this figure correctly. From 1990 to 2020, Troy Springs was flowing at less than 0.5 cfs, but the RTF adjustment factor shows that it would have been flowing at approx. 2.75 cfs if not for groundwater withdrawals?

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1) USR Report Page 7.

Why is White Sulphur Springs one of the 9 that have been identified for MFL Assessment, in light of the fact that it only flows when the aquifer is draining from water backed up during a flood event?

2) Page 30, Paragraph 5, last sentence:

"Every river that crosses the Cody Scarp within the SRWMD goes underground and reemerges downstream as a spring, with the sole exception of the Suwannee River (SRWMD, 2016b)".

Is this true of the Withlacoochee River? This sentence implies that the Withlacoochee is similar to the Santa Fe, where the entire river does go underground then emerges as a spring. I know there are sinks on the Withlacoochee near Valdosta but I don't think these are near the Cody Scarp.

On page 4 of the USR report, the following language is used to describe the river/Cody Scarp interaction:

Regionally, the Cody Scarp denotes a transition between the Tallahassee Hills and Northern Highlands and the relatively flat coastal region of the Gulf Coastal Lowlands. The escarpment approximates the transition of the Floridan aquifer from a regionally confined to an unconfined system. Locally, and especially in the study area, the escarpment follows the major river valleys (Figure 2). In the river valleys and other drainage features, where the thin clastic cover is commonly breached by erosion, surface drainage either disappears underground through karst features (e.g., sinks on the Alapaha and Withlacoochee Rivers) or the river may lose or gain water depending on the relative groundwater and surface water levels (e.g.,on the Suwannee River). Numerous springs and resurgences occur downstream of the escarpment.

This text just states that there are sinks on the Withlacoochee, not that the entire river goes underground. Recommend you reconcile the text on page 4 and page 30.

Dr. Adam Munson
Comments and Questions

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My primary item for discussion is the Gulf Sturgeon but a couple of other things I would like to discuss. I think these are the largest items and the ones I would most like to openly discuss.

1) Is 15 ft the right width…or at least reasonable. Notes below.
    a. GS passage quote from report - the elevation at which at least 3 feet of water covers 15 feet of streambed was determined. This follows parameters use in the Lower Santa Fe and Ichetucknee Rivers MFL Re-evaluation Report, citing personal communication with M. Randall, 2013 (HSW, 2021).
    b. The above is not what I found in the LSFIR report. The LSFIR report said this - The USGS has recommended a minimum depth of three feet, or about twice the maximum body depth of an adult female sturgeon, for fish passage (M. Randall, Personal Communication 2013). A channel width of no less than 15 feet, or about twice the body length of a large female adult, would allow adult sturgeon to turn in the river.
    c. So, the 15 ft was not attributed to the Randall in the LSFIR report…at least not on page 80. Can we clarify the 15ft turning radius?

2) When exactly do they spawn and migrate? And more importantly which months precisely did you include in the evaluation?
    a. Quote Appendix VII - Both the February-April and the September-November migrations were further assessed for seasonality.
    b. Appendix VII Table 4, and main doc Table 3-3 – Only March, April, Sep, and Oct are in Teal.
    c. Quote from the LSFIR Report - primary spring spawning period in March and April, and a second period of spawning occurs from early September through October (Randall and Sulak 2007). After fall spawning, down-river movement into the Gulf of Mexico occurs during September and October.
    d. Page 95 of report - so the critical flow was further assessed by season (February-April and September-November)
    e. So, I am confused if Feb and November are included. It is also not clear if they should be or not and what the difference would mean to the MFL.
    f. BUT Fig 2-12 suggest November is probably the lowest flow month and Feb is different than March and April. Including these low flow months would certainly reduce the exceedances of any evaluated metric from the 90s down to the flatter part of the curve.
    g. I think the period that is evaluated is worth discussion.

3) I am very interested in the sensitivity of this metric to both the 15 foot and the choice of seasonal extent.
    a. i.e. if we changed the 15 ft to 16, 17, 18 or 14, 13, 12 what would the marginal effect of a foot be? Minimal I suspect but it might be nice to demonstrate that even if that number is not the most studied it is perhaps not critical….

b. I would be interest in the sensitivity to the choice of seasons also, though I think monthly blocks are probably granular enough, and so we are only concerned with the choice of 2 or 3.

4) Moving on from the Sturgeon. You are proposing a single reduction which is consistent with other waterbodies and with the regulation of GW. But you say the following in Appendix X.
    a. Appendix X page 3. "The underlying premise of applying a single-value flow reduction below median flows is the assumption that regional withdrawals are from groundwater pumping. If surface water diversions are proposed in the future, then larger volumes of water would be available without causing significant harm when flows are above median conditions."
    b. Please clarify the above statement.
        i. Are you saying that water is available under this proposed rule at higher flows if it is a surface water use?
        ii. Or are you are saying if there was another study and the MFL rule was altered that more water at high flows would likely be identified as available for surface water use.

5) The Gulf Sturgeon passage criteria was not criticized during the LSFIR peer review and I have no better suggestion (than 3 ft by 15 ft) and don't intend to criticize it now. But importantly it was also not critical and would not have change the LSFIR MFL. The SFIR had allot of indicators buttressing each other and that redundancy was comforting and diminished the importance of sensitivity to any one WRV metric. The LSFIR had SAV, Hydric Soils, Woody habitat, the reach method, General Fish Passage, SEFA and Cyprus Swamp all limiting or near limiting. The shift to the next limiting metric was only a few cfs. So the hydrology was very important to minimize uncertainty but the biology is always full of uncertainty.

    But, on this river the Sturgeon passage is the only WRA metric determined to be limiting. Moreso, I think Table 5-2 and 5-3 indicate that in the absence of Sturgeon the allowable hydraulic shift would be about 57% and 111% higher.

    I guess my point here is that I have work on quite a few river MFLs and though I can think of a can of time things have worked out like this. Most of the time there is significant parallel evidence for limiting flows. So, my initial thought is that the uncertainty in the development of this criteria is important and should be addressed. I think you have used the best available, location specific information, but sensitivity to its accuracy should be valuated and it should be confirmed if possible. Again I will defer to Marty as our sturgeon expert.

Dr. Martin Hamel
Comments and Questions

Received on 4/7/2023

Good morning everyone, below are some broader discussion points that have come to mind as I read through the reports. I am mostly interested in hearing discussion from Gregg and Adam regarding the use or development of the HEC-RAS and NFSEG models. These models are vital in establishing all the components of the MFL, but understanding model development and validation is challenging as it requires reading multiple documents (appendices and cited reports).

- Establishing the RFT
    - Using the NFSEG model to indicate how much groundwater was removed, those amounts were added back to the annual flow recordings to indicate a long-term baseline of water discharge. I would like to discuss the validity of this approach and what other studies evaluating environmental flows have used for reference flows.
- Gulf Sturgeon
    - It is not clear to me what habitat need is being addressed in the instream habitat suitability modeling for Gulf Sturgeon. Instream habitat will vary greatly throughout the year for each life stage of the fish. Are holding areas specifically considered under the habitat suitability modelling?
    - Habitat use and the necessary flow requirements for survival of Gulf Sturgeon fry is not accounted for. This is likely due to a lack of information. Floodplain connectivity during the exogenous feeding stage is likely an important factor for survival – either through increased productivity (prey resources) or habitat use (off-channel occupancy). Fall spawning can be an important evolutionary adaptation that allows the species to persist through variable environmental/climatic conditions. While flow assessments account for fall spawning requirements for the adults, there is no attention for fry/fingerlings/and early juveniles that may need specific flows to survive.

I am not sure how specific I should be in bringing up these discussion topics for the peer review meetings. I think it will be good to dive into the first one and then be able to better prepare for a second.