

**PEER REVIEW FORM**  
**SUWANNEE RIVER WATER MANAGEMENT DISTRICT**



**Project Name:** MINIMUM FLOWS AND LEVELS ASSESSMENT FOR THE UPPER AND MIDDLE SUWANNEE RIVER

**Name and Affiliation of Reviewer:** Adam Munson PE PhD, University of Florida, ISOM

**Discipline specialty/specialties covered by this review:** MFL Development and Quantitively Analytics.

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**REVIEW REQUIRED BY THE DISTRICT:**

**1. Determine whether the methods used for establishing the minimum flows are scientifically reasonable.**

A. Supporting Data and Information: Review the data and information that supports the methods and the proposed minimum flows, as appropriate. The reviewer shall assume the following:

1. The data and information used were properly collected;
2. Reasonable quality assurance assessments were performed on the data and information.

B. Technical Assumptions: Review the technical assumptions inherent in the methodology and determine:

1. If the assumptions are clearly stated, reasonable and consistent with the best information available; and
2. Assumptions were eliminated to the extent possible, based on available information.

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C. Procedures and Analyses: Review the procedures and analyses used in developing quantitative measures and determine qualitatively whether:

1. The procedures and analyses were appropriate and reasonable, based on the best information available;
2. The procedures and analyses incorporate appropriate factors;
3. The procedures and analyses were correctly applied;
4. Limitations and imprecision in the information were reasonably handled;
5. The procedures and analyses are repeatable;
6. Conclusions based on the procedures and analyses are supported by the data.

**2. If a proposed method used in the MFL report is not scientifically reasonable, the reviewer shall:**

- A. Deficiencies: List and describe scientific deficiencies;
- B. Remedies: Determine if the identified deficiencies can be remedied and provide suggested remedies;
- C. If the identified deficiencies can be remedied, then describe the necessary corrections and, if possible provide an estimate of time and effort required to develop and implement; and
- D. If the identified deficiencies cannot be remedied, then, if possible, identify one or more alternative methods that are scientifically reasonable, based on published literature to the extent feasible.

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1. The selection of waterbodies or aquifers for which minimum flow and/or levels have been proposed;
2. The consideration given to changes and structural alterations to watersheds, surface waters, and aquifers, and the effects and constraints that such changes or alterations have had on the hydrology of a given watershed, surface water, or aquifer;
3. The method(s) used for establishing MFLs for other waterbodies and aquifers;

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4. The selection and determination of the best available models used for MFL analyses such as the HEC-RAS surface water model and North Florida Southeast Georgia (NFSEG) regional groundwater model; and
5. Standard procedures used as part of institutional programs that have been established for the purpose of collecting data, such as the USGS and SRWMD hydrologic monitoring networks.

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3. The reviewer also certifies that the review was conducted according to the Scope of Work specified above.

<b>Signature of Reviewer:</b> 	<b>Date of Peer Review:</b> 6/20/2023
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**Responders Certification:** The comments and criticisms provided by the Peer Reviewer have been addressed as noted in column C in a separate response document, which is attached, and in the report.

<b>Name and Affiliation of Responder to Peer Review Comments:</b>	
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			A. Reviewer's Specific Comments	B. Reviewer's Specific Recommended Corrective Action	C. Action to be Taken in Response to Comment
1	Appendix A and Section 2.4 of USR	No	<p>The discussion of record extension and gap filling in the USR report could be improved. The text has only a brief outline and makes claims of “appropriate techniques”, “good agreement”, and “rigorous relations”. Little evidence or definition is added. The supporting appendix is (I believe) SPSS output and not very consumable for most readers. Regression is a reasonable tool for data extension and alternatives (regressions) were explored. The evidence in the appendix does support the use of the regression model. Predictions closer to actual at a higher rate than expected by a gaussian distribution but still symmetric. However, the report (especially the appendix) would benefit from additional discussion of the statistics and not just allot of screen captures. This issue is more noticeable because the District in the</p>	<p>Suggest at least some discussion in Appendix A supporting claims in the main text or expanded discussion the main text reducing expectations of the appendix.</p>	

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			MSR has provided a more informative text and used alternate methods. This of course invites comparison.		
2	USR Appendix A	Likely Not	I would have liked to have seen calibration and validation data sets. Graphs similar to Figure 6(a and B) in Appendix 1 of the MSR would have been welcome. Bias would be more easily examined. Thank you for presenting regression results, p-p plots, residual plots, VIF, etc. Distillation of the information is typically the job of the authors. This presentation seems an afterthought rather than a report on the procedure and results.	Note for future reports.	
2	MSR page 19 and Appendix 1	No	The difference in gap filling and record extensions between the two reports is notable. As is often the case multiple numeric methods are available to reasonably complete the same task and decisions must be made. I believe the USR and MSR have both	Address the bias in the text	

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			used reasonable methods and I do not find logical flaw with either, through greater evidence supporting the conclusions and contentions of each would be welcome (USR noted above). Specific to the MSR are figure 6a and 6b or Appendix I. The MAE and ME are about the same (.26 and .2 ft). The model seems to routinely underpredict stage, albeit by less than a half foot. The Flow is better with an MAE of 187 cfs while the ME is only 21 cfs suggesting less bias in the flow imputations.		
	USR p. 16 para 3	No	You have chosen a smoothing parameter of .33 for All LOESS curves. The choice feels arbitrary. From a hydrologic perspective the choice should be explained as it represents a choice to smooth over a considerable period of time. The curves do not play a central role in the MFL development, but they are a visual queue to the reader. By contrast in the MSR I	Add a sentence or a few explaining the choice and why is it the same regardless of the data it is used on.	

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			do not think you ever mention what your smoothing parameter is.		
4	MSR 2.4.1 & USR 2.5.2	No	Both reports have the same graph, but the USR identifies the AMO as a cool/wet phase from WY 1970-1999 and the MSR identifies the middle cool period as 1960-2000. The interpretation of the same graph should be the same in both reports. More importantly, the Wet/cool and warm/dry interpretation present only in the USR is perhaps too generalized to peninsular Florida. The Continental US reverses the wet/cool warm/dry and much of the USR basin is in southern Georgia.	Change one so the dates are consistent. No other action requested.	
5			Appendix B is improved from the LSFIR		
6	MSR p 39	No	Figure 2-21 is cited but figure 2-21 is average rainfall. I believe 2-26 was intended.	Correct Reference.	

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7	USR 2.7.3 p28	Yes	<p>The Lake city well has a record back to 1948. It is the longest record, and you extended the records of other wells using linear association between their records and the Lake City FDOT well. These are presented in Figure 22 and records seem to generally be extended about 30 years. I was unable to find (perhaps I missed it in some appendix) the linear relation that was use or any description of its validity. I do note from the graphs some concerns. For example, the Peter Deas well is often measured higher than the Lake City well in observations, but in the extension never once exceeds the Lake City well. Howard Morgan on the other hand is extended to be above White Springs when it has not been observed to exceed white springs. This might all make sense but is unexplained.</p>	<p>Provide a discussion of the hindcasting for these wells to 1948.</p>	
	MSR	Yes	<p>I note in section 2.5 of the MSR that no record extensions of the wells seem to have been undertaken</p>	<p>Explain why in the USR the well records</p>	

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			<p>even though they are shorter. It is unclear what these well records are used for but coming right before the RTF discussion I presume they were used in the creation of the RTF adjustment factor? If so, I feel any recreated record warrant discussion from the USR and if one was made in the MSR. Also, if it was used in the RTF should the recreation go back to the start of the RTF adjustment in 1933 (assumed from appendix VII). I completely defer to Dr. Jones on this topic, but I feel as if the inclusion of the generalized Appendix VII in lieu of study specific details is hampering my ability to fully evaluate the accuracy of the RTF adjustment.</p>	<p>were extended and in the MSR they were not. Explain if both were extended for use in the RTF adjustment. The use of the short-term ones in the flood plain studies was made evident in Appendix V. Please clarify any additional use of these wells.</p>	
	MSR section 2.7	Yes	<p>It is confounding to me that we see the estimated flow reductions from the NESEG model in the reports, but the data presented in the Appendix is for Ft. White. I appreciate the logic and agree this is a</p>	<p>Expand details of RTF adjustment either in</p>	

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	USR Section 2.9		reasonable approach. It has been employed previously but it seems generating a report specific to the MSR and LSR would be easy since you have a template from Ft. White, and you have already preformed the model runs.	appendix or main body.	
	MSR Section 5.2.1 section 5.2.1	Yes	The 3ft of depth is the reasonable and the 15ft width is at least logical if somewhat untested for sturgeon passage. I remain concerned that the only WRA that is limiting is fish passage and it is based on a relatively undocumented standard. My concern is narrow. It is that once a peer review panel endorses something as reasonable it can be cited as evidence of reasonableness. I would rather our report say this is best available information which I believe is accurate but leave the door more broadly open when it comes time for re-evaluation.	This has been addressed in the final peer review report with additional expertise form Dr. Martin Hamel.	

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8	MSR P. 1 Para 2	No	"by standard and common practices, MFLs are set based on the applicable, suitable, and best available information."	This is in accordance with FS. Not simply by common practice.	
9	MSR p. 10 pa. 1	No	Wording? "the floodplain in this portion of the river 10s allowing springs adjacent to the river to maintain openings"	Explain 10s or correct wording	
	MSR p 40	No	Error Reference not found	Correct reference.	
	Appendix X page 3		You state "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."	Please clarify this statement. Specifically, is the "Median condition" an important delineator and if so why?	

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**Name and Affiliation of Reviewer:** Gregg W. Jones, P.G., PhD

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<b>Upper Suwannee River MFL Report Comments</b>					
1	P. 31	No	<p>Report States: <i>"The USR has cut a channel that gradually deepens from about 20 feet near Benton to about 45 feet near Ellaville. The updip limit of the Floridan aquifer system occurs at about river mile 170; i.e., near White Springs"</i>.</p> <p>I assume this is referring to 20 feet below land surface to 45 feet below land surface? This should be specified in the report.</p>	Specify in the MFL report .	
2	Page 39, Fig 30.	No	<p>Caption for Figure 30: <i>"Estimated net yearly groundwater withdrawal impacts to the Suwannee River at five USGS gages [Fargo, Benton, and White Springs plot near or at zero and are indistinguishable from one another"</i>.</p> <p>How can the impact be near zero at the White Springs gage given that White Sulphur Springs has mostly ceased flowing? Apparently, it is because the gage is upstream of where White</p>	<p>Recommend the District include this information in the report. Figure 30 should be modified or at least explained better because what it currently depicts is misleading.</p>	

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			Sulphur Springs discharge enters the river. Because it's upstream, it has not recorded the flow of White Sulphur Springs so the influence of the historic decline in spring flow on river flow wouldn't have been recorded.		
<b>Middle Suwannee River MFL Report Comments</b>					
1	Mikel Clifton Well Data Page 38 Figure 2-27	No	Mikel Clifton groundwater well data is supposed to start in 1977 but it appears the graph contains no data prior to about 1982.	Check MFL Report and revise if necessary.	
2	Page 39, Figure 2-28	No	Caption to this figure says "Annual Water Level" but each individual graph refers to it as annual average. I assume it is annual average?	Address this in the MFL report if necessary.	

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3	Shallow Groundwater Monitor Wells.  Page 39 Paragraph 1, Figure 2-28.	No	<p>In paragraph 1 it is stated that: <i>"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"</i>.</p> <p>If the wells were only monitored for 1 year, how did they provide useful information for floods that occur once every 5 years?</p>	Revise MFL report to address this comment.	

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4	Availability of Water for Water Supply at High Flows. Page 83, Figure 4-3.	No	<p>Within the box in the lower left corner of the graph in Figure 4-3, it is stated that the amount available for withdrawal is "H". I don't see H anywhere on the graph but I assume H is the vertical difference between where the dashed green RTF line intersects the y axis and where the dashed orange critical flow line intersects the y axis and H should equal 545 cfs.</p> <p>Referring to the distance between those lines as the "amount available for withdrawal" is confusing. It should be referred to as the amount of water available when the flow equals 2,461 cfs. If the flow is above 2,461 cfs, would the amount of water available be the difference between that flow and 1,916 cfs critical flow? I'm concerned the way it is currently presented gives the impression that the largest amount of water available for water supply will never be more than 545 cfs. Of course, 545 cfs is a very large volume of water (352 million gallons per day (mgd)). The</p>	<p>Revise the graph to include "H". Consider revising the wording of the "amount available for withdrawals" on the graph as stated in the comment. Place more emphasis on the fact that a great deal of water is available at high flows and that harvesting it for water supply would result in very minimal impacts to the Water Resource Values.</p>	

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			<p>following is an example of what this means in terms of water supply.</p> <p>The Peace River/Manasota Regional Water Supply Authority in DeSoto County Florida has an off-stream reservoir with a capacity of 6 billion gallons. Their pump/intake system can move 120 mgd from the river to the reservoir, which, based on the proposed minimum flow for the MSR, is only 36 percent of the 352 mgd available for water supply in the Suwannee River when the flow is 2,461 cfs. The 120 mgd pumping capacity could fill a reservoir with 6 billion gallon capacity in just 50 days. When considered that the RTF flow of 2,461 cfs is exceeded 70.4 percent of the time, it becomes apparent that a very large volume of water can be harvested from the Suwannee River with very minimal impact to the Water Resource Values.</p>		
5	Establishing a high flow	No	The last sentence in the paragraph states: <i>"While it is possible to designate MFLs for</i>	Provide a better explanation in the text of what this sentence means	

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	minimum level. Page 140.		<p><i>multiple flow conditions for a particular gage, prescribing a single MFL flow condition at a gage provides efficacy from a water management perspective".</i></p> <p>It is not clear what this means. I think it means the District wants to use the most restrictive WRV to produce a low-flow minimum flow that would protect all other WRVs, so it would not be necessary to establish high flow minimums. But this makes no provision for water withdrawals at high flows. My previous comments have expressed the importance of establishing high flow minimum flows to identify volumes of water that could be harvested for water supply during high flow periods. So even though setting only a low flow MFL may simplify the water management process, it does not provide sufficient guidance for determining water availability over the full range of flows.</p>	and/or revise it to indicate that it is beneficial to determine the available amount of water for water supply at the full range of flows.	
<b>Upper and Middle Suwannee River MFL Reports</b>					

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1	Water Resource Values – Maintenance of Freshwater Storage & Supply as it relates to the Floridan aquifer. USR Report Page 63. MSR Report, Page 77, 4.1.5.	No	<p>The USR/MSR Reports undervalue the importance of WRV 5, Maintenance of Freshwater Storage and Supply, as it relates to the FAS. The USR report devotes just a brief paragraph to the subject – page 63: The USR MFL Report states: “Spring flow is an indicator of groundwater storage; hence, WRV 5 is relevant primarily to the spring MFLs that are being developed and will be presented in a separate document”.</p> <p>The MSR Report only states: “the FAS is identified as “a major regional freshwater storage feature”, and does not elaborate further. It is then explained that the river’s floodplain provides storage for at least several weeks following flood pulses, and then states: “the proposed river MFL protects floodplain communities against adverse dewatering via WRVs 1, 2, and 8; and is therefore assumed to prevent significant harm to the maintenance of freshwater storage in the region.” The next sentence states: “Additionally, MSR priority springs MFLs, which will be addressed in a separate document, will protect spring flows by maintaining critical aquifer levels.” It is not</p>	<p>This is a complex issue that should be addressed with at least some discussion. Recommend the District place more emphasis on WRV 5 as it pertains to the FAS. Before concluding that WRV 5 for the FAS can be protected by establishing minimum flows for springs, consider creating a conceptual model of what the complex equilibrium was between river flow, spring flow, and aquifer levels prior to development. Because of the magnitude of current groundwater withdrawals and other modifications to the system, it may not be possible to manage the system in a way that even remotely mimics the predevelopment equilibrium. However, having this information may better inform the process of establishing MFLs for both river and spring minimum flows. Recommend addressing this in the adaptive management section as an</p>	

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			<p>clear but apparently only assumed in both reports that MFLs for springs will protect WRV 5 as it pertains to the FAS.</p> <p>First, the District does not place sufficient importance on WRV 5 for the FAS. There is more text devoted to floodplain storage (which is seasonal, and a relatively small volume compared to the FAS) than to FAS storage. Second, managing FAS storage by setting MFLs for springs may not be sufficient – I would like to see a discussion of why the District thinks it would be.</p> <p>River levels have a major impact on FAS water storage. Lower river levels allow the FAS to drain more quickly through springs and diffuse discharge. Higher river levels back water up into the spring runs, which reduces Floridan aquifer discharge, resulting in more storage in the aquifer.</p> <p>The District's proposal to maintain aquifer storage by establishing springs MFLs may have the opposite effect. For example, determining that a spring needs to flow at a</p>	<p>important consideration for future revisions of river and springs MFLs.</p>	

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			higher level to maintain the ecology of the spring run will cause aquifer storage to be depleted more quickly, which will result in lower groundwater levels in the region.		
2	Figures 72, 73 USR Report & Figures 6-1, 6-2 MSR Report:	No	It is possible I am not understanding these figures, but it appears to me that at the 5% exceedance flow, which is a very high flow, the dashed red limiting WRV line is coincident with the RTF flow condition. This appears to me to indicate that no water is available at this high level of flow. I doubt this is the District's intent.	Recommend the referenced figures be reevaluated or better explained to ensure they do not convey the message that significant water volumes are not available at high flows for water supply. In addition, a brief discussion should be added regarding water availability at high flows. In the adaptive management section, consider a discussion of the need to eventually establish high flow minimum levels and the types of data that would need to start being collected in the near future to establish such levels.	

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3	High Flows and Water Supply,	No	It is important to determine some level of understanding of the availability of water at high flows for water supply in these MFL reports. The SWFWMD assisted with the development of two large off-stream reservoirs that only filled from rivers during periods of high flow. To ensure that harvesting water at high flows did not cause significant harm to the river, SWFWMD established high flow minimum levels in addition to low flow minimum levels.	Recommend the District add a discussion of the following concept: The Suwannee River frequently flows at very high levels. During these periods, water could be pumped from the river and stored in an off-stream reservoir for municipal, agricultural, or mining water supply, which could offset groundwater pumping, or it could be pumped to high recharge areas to recover depressed groundwater levels in the Floridan aquifer. Something like this could be part of a recovery/prevention strategy if one is necessary.	
4	USR MFL Report	No	The use of a groundwater flow model to determine long-term impacts on flow from	No recommended action	

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	Appendix B and C and MSR MFL Report Appendix VI and VII (Reference Time Frame and NFSEG Groundwater Model):		groundwater withdrawals was a recommendation of the Peer Review Panel that conducted the original review of the MSR proposed minimum flow in 2017. The current panel is pleased to see that this recommendation was implemented and that it was implemented through a cooperative effort between the Districts, the USGS, the State of Georgia, and other entities.		
5	Appendix 10, 2.0 Development of MFL Criteria.	No	The text is as follows: <i>"It was determined that a single value flow reduction approach would be taken, using the most restrictive or limiting critical flows. In the case of both Ellaville and Branford, this corresponds with Gulf sturgeon fall passage and results in a reduction of 346 cfs across the flow duration curve for Ellaville and 400 cfs for Branford. The underlying premise of applying a single-value flow reduction below median flows is the assumption that regional withdrawals are</i>	If I am correct about this, recommend rewording the sentence, because when it says <i>"regional withdrawals"</i> , it implies significant surface water. Recommend changing the sentence to read: <i>"The underlying premise of applying a single-value flow reduction below median flows is the assumption that historic declines in river flow are caused by groundwater pumping</i>	

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			<p><i>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".</i></p> <p>What is meant by regional withdrawals? Since there are no significant surface water withdrawals from the river, I assume the District is saying that regional withdrawals is the same as baseflow/springflow that was prevented from reaching the river as the result of regional groundwater withdrawals? If so, it then follows that the historic river flow reductions are the result of regional groundwater withdrawals.</p>	<p><i>that has reduced the amount of baseflow and springflow reaching the river."</i></p>	
6	RTF Appendices	No	<p>RTF Error Analysis: Developing the RTF required a number of steps, each of which required development of estimates based on data records that were incomplete to varying degrees. Gaps in data records were reconstructed or hindcasted using various statistical techniques. The assumption in-</p>	<p>Because the RTF flows are integral to the development of the proposed minimum flow, the District should conduct an analysis to evaluate the error inherent in the process and determine the degree to which the</p>	

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			herent in each step was that sufficient accuracy was obtained to allow the results to be used in the NFSEG model (which has its own inherent error) and that the results of the model calculation would also be sufficiently accurate. The concern is that error inherent in each step is carried forward and compounded in subsequent steps.	error effects the calculation of the minimum flows.	
7	RTF Appendices	No	<p>In the RTF Appendices for both reports, it is stated: <i>"To help with illustration of the process of the development of RTF time-series, numerical values from the analysis conducted at the USGS gage on Santa Fe River Near Ft. White will be used as an example"</i>.</p> <p>I assume the District developed the RTF flow for the four USR/MSR MFL gages using river flow data, groundwater use data, and groundwater-level data that was specific to the USR and MSR regions. What is confusing is that in the appendices for both MFL</p>	<p>Make it clear where I have cited the reference in the adjacent column, why the Ft. White gage was used for the RTF development example instead of the MSR/USR gages and that the RTF analysis was actually completed using data for the MSR/USR gages and groundwater data for the MSR/USR region.</p>	

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			reports, the process for the development of the RTF is illustrated using the analysis conducted for the Ft. White gage for the Santa Fe River. Is it correct to assume this was done to reduce the effort that would have been required to produce all the text and graphics specific to the development of the RTF for the USR and MSR regions to use for the example?		
8	Injection Well Hindcasting Appendix B, Part 2:	No	Appendix B describes how the historic volume of reclaimed water injected/recharged into the FAS in Alachua County was determined for the NFSEG model. The text in the Appendix implies that recharge/injection only occurred in Alachua County. Is this county the only place in the entire NFSEG model domain where injection/recharge occurred? I'm assuming the NFSEG model considers recharge to the FAS from agricultural irrigation where the FAS is unconfined? This is probably a significant source of recharge.	If Alachua is the only county in the NFSEG model domain where artificial injection/recharge occurs, It should be stated in the introduction to the Appendix. Also, there should be a brief discussion that explains the difference between recharge from artificial injection and recharge from agricultural irrigation in unconfined areas and how they are dealt with differently in the NFSEG model.	

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9	High Flows and Water Supply  Figures 72, 73 USR Report & Figures 6-1, 6-2 MSR Report	No	<p>It is important to determine some level of understanding of the availability of water at high flows for water supply in these MFL reports. The SWFWMD assisted with the development of two large off-stream reservoirs that only filled from rivers during periods of high flow. To ensure that harvesting water at high flows did not cause significant harm to the river, SWFWMD established high flow minimum levels in addition to low flow minimum levels.</p> <p>The river frequently flows at very high levels. During these periods, water could be pumped from the river and stored in an off-stream reservoir for municipal, agricultural, or mining water supply, which could offset groundwater pumping, or it could be pumped to high recharge areas to recover depressed groundwater levels in the Floridan aquifer. Something like this could be part of a</p>	<p>Recommend the referenced figures be reevaluated or better explained to ensure they do not convey the message that significant water volumes are not available at high flows for water supply. In addition, a brief discussion should be added regarding water availability at high flows. In the adaptive management section, consider a discussion of the need to eventually establish high flow minimum levels and the types of data that would need to start being collected in the near future to establish such levels.</p>	

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			<p>recovery/prevention strategy if one is necessary.</p> <p>Figures 72 and 73 and Figures 6-1 and 6-2 in the USR and MSR reports, respectively, provide an idea of availability of water at high flows. It's possible I'm not understanding these figures but it appears to me that at the 5% exceedance flow, which is a very high flow, the dashed red limiting WRV line is coincident with the RTF flow condition. This appears to me to indicate that no water is available at this high level of flow. I doubt this is the District's intent.</p>		
10	Drought Concerns	No	<p>What will the District's approach be if river flow drops below the established minimums for an extended period due to drought? Droughts are a natural occurrence not related to groundwater withdrawals but groundwater withdrawals, especially for agriculture, will most certainly increase during droughts,</p>	<p>Recommend the District add a discussion of extended drought and at least a preliminary discussion of how it will impact the District's approach to meeting the proposed minimum flows.</p>	

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			which will further reduce river flow. Although the details of how this will be managed may be part of the consumptive use permitting process, the issue should be at least briefly discussed in the MFL report.		

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**Project Name:** MINIMUM FLOWS AND LEVELS ASSESSMENT FOR THE UPPER AND MIDDLE SUWANNEE RIVER

**Name and Affiliation of Reviewer:** Martin Hamel, University of Georgia

**Discipline specialty/specialties covered by this review:** Fish Ecology

This document is for the use of project peer reviewers retained by the Suwannee River Water Management District (District) for the purpose of providing a technical peer review of a District report, including manuscripts prepared by District staff and consultants.

**REVIEW REQUIRED BY THE DISTRICT:**

**1. Determine whether the methods used for establishing the minimum flows are scientifically reasonable.**

A. Supporting Data and Information: Review the data and information that supports the methods and the proposed minimum flows, as appropriate. The reviewer shall assume the following:

1. The data and information used were properly collected;
2. Reasonable quality assurance assessments were performed on the data and information.

B. Technical Assumptions: Review the technical assumptions inherent in the methodology and determine:

1. If the assumptions are clearly stated, reasonable and consistent with the best information available; and
2. Assumptions were eliminated to the extent possible, based on available information.

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C. Procedures and Analyses: Review the procedures and analyses used in developing quantitative measures and determine qualitatively whether:

1. The procedures and analyses were appropriate and reasonable, based on the best information available;
2. The procedures and analyses incorporate appropriate factors;
3. The procedures and analyses were correctly applied;
4. Limitations and imprecision in the information were reasonably handled;
5. The procedures and analyses are repeatable;
6. Conclusions based on the procedures and analyses are supported by the data.

**2. If a proposed method used in the MFL report is not scientifically reasonable, the reviewer shall:**

- A. Deficiencies: List and describe scientific deficiencies;
- B. Remedies: Determine if the identified deficiencies can be remedied and provide suggested remedies;
- C. If the identified deficiencies can be remedied, then describe the necessary corrections and, if possible provide an estimate of time and effort required to develop and implement; and
- D. If the identified deficiencies cannot be remedied, then, if possible, identify one or more alternative methods that are scientifically reasonable, based on published literature to the extent feasible.

**REVIEW CONSTRAINTS:**

The Peer Reviewer shall acknowledge the statutory constraints and conditions (Sections 373.042 and 373.0421, Florida Statutes) affecting the District's development of MFLs. The Peer Reviewer shall also acknowledge that review of certain assumptions, conditions, and established legal and policy interpretations of the Governing Board is not included in the scope of work. These include:

1. The selection of waterbodies or aquifers for which minimum flow and/or levels have been proposed;
2. The consideration given to changes and structural alterations to watersheds, surface waters, and aquifers, and the effects and constraints that such changes or alterations have had on the hydrology of a given watershed, surface water, or aquifer;
3. The method(s) used for establishing MFLs for other waterbodies and aquifers;

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4. The selection and determination of the best available models used for MFL analyses such as the HEC-RAS surface water model and North Florida Southeast Georgia (NFSEG) regional groundwater model; and
5. Standard procedures used as part of institutional programs that have been established for the purpose of collecting data, such as the USGS and SRWMD hydrologic monitoring networks.

**Instructions:**

1. The results of this review are for the use of the District and they are not to be revealed to others without the express permission of the District.
2. By signing this form, the Peer Reviewer certifies that the peer review was conducted according to the guidelines listed above and that the opinions and recommendations included in the review constitute an independent review per Chapter 373.042(5), in the discipline noted above.
3. The reviewer also certifies that the review was conducted according to the Scope of Work specified above.

<b>Signature of Reviewer:</b> 	<b>Date of Peer Review: 6/20/2023</b>
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**Responders Certification:** The comments and criticisms provided by the Peer Reviewer have been addressed as noted in column C in a separate response document, which is attached, and in the report.

<b>Name and Affiliation of Responder to Peer Review Comments:</b>	
<b>Signature of Responder:</b>	<b>Date of Response:</b>

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1	USR – P. 46	No	Table 7 provides generalized categories for fish assemblages and indicates that three different guilds are present in the USR. However, there is no reference to these categories (i.e., the development of them), or the diversity/richness of species from each of the guild classifications.	Please provide additional information.	
2	USR – P.64	Possibly	The last sentence on P.64 indicates that habitat suitability curves were created for Gulf Sturgeon and published in a technical report (ICF Jones and Stokes, 2009). I could not gain access to this report, but the title suggests that the report was evaluating water withdrawals on the Pascagoula River in Mississippi. HSC development on a different river system could result in very different preferences	Please provide additional information on the development and use of HSC's for Gulf Sturgeon. Were habitat data from the Pascagoula River used in developing habitat preference in the Suwannee River? How were the habitat data collected in the Pascagoula	

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			for depth/velocity combinations than the Suwannee River.	River and how similar are these two river systems?	
3	USR – p. 93	No	I appreciate being transparent about the uncertainty in the data acquisition and analyses that went into this report. This list is not exhaustive though and there are several uncertainties surrounding Gulf Sturgeon that were not addressed. This may be more of a concern in the MSR, but they are still relevant in the USR.	Include additional uncertainties surrounding Gulf Sturgeon (these issues will be brought up in subsequent review comments).	
4	USR – p. 102	Yes	Fish passage was focused on minimum depth and river width but fails to account for velocity. Although sturgeon are fluvial dependent species, they are not particularly adept at swimming in high velocity environments, particularly when	Although there is a knowledge gap for critical swimming and burst speeds on adult Gulf Sturgeon, additional analyses to show the change in velocity profiles under low	

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			<p>traversing structures requiring burst swimming speeds. Little information exists on sturgeon burst speeds, but research has been conducted examining critical swimming speeds (i.e., endurance or maximum aerobic swimming capacity) of various juvenile sturgeon. Little information exists for adult sturgeon due to size constraints in flume-tested experiments. Wilkens et al. (2015) determined that the juvenile Gulf Sturgeon critical swimming speed was 0.21 meters per second. Finally, multiple studies have examined critical swimming speed at varying temperature regimes. This should be accounted for by looking at the mean monthly water temperature for the time period when passage occurs.</p>	<p>flow conditions is warranted. Low flow (or future flow reductions) may constrict flow to the passage areas, increasing velocity and limiting passage. Do these velocities surpass the critical swimming speeds of juvenile Gulf Sturgeon (0.21 m/s)?</p>	

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5	MSR – p. 66	No	Holding areas are a critical habitat type for adult Gulf Sturgeon that are used post-spawn. The definition of holding areas is perhaps a bit vague due to the lack of knowledge on the specific attributes that make up these habitats. Generally speaking, holding areas are deep water habitats with <b>slow velocity</b> . Flow reductions did not consider changes to holding area habitats – specific to depth and velocity – and should be considered in future iterations.	Identify holding area depth and velocity information (if available) and incorporate that into the Gulf Sturgeon habitat criteria assessed for flow requirements.	
6	MSR – p.66	No	In the second to last paragraph, it was stated “It is unclear whether the newly identified spawning locations are a result	Please clarify.	

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			of spawning range expansion or advancements in technology allowing for enhanced biological inference." Please explain what technological advancements were being used.		
7	MSR – p. 68	No	There was a sentence in the second paragraph that indicates “preferred habitat” for Suwannee Bass was neutral or basic water occurring near springs. Please see Strong et al. (2010), Nagid et al. (2014), and Yeager (2022) for an actual description of habitat preference or associations.	Please elaborate on habitat preferences. The pH of the river may be an important attribute that dictates their presence in this particular river, but it isn't a habitat they are selecting.	
8	MSR – p. 69	No	In Table 3-3, there are X's that indicate fry seasonality. I am not sure why fry	Please update.	

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			seasonality cannot be inferred for Suwannee Bass and Gulf Sturgeon as well.		
9	MSR – p. 79	No	In Table 4-1, there is a column labeled “General Flow Regime”. What do the Low, Medium, and High levels refer to?	Please provide a range of flows for each category.	
10	MSR – p. 132	?	In Tables 5-2 and 5-3, the analyses refer to the number of days per year that a particular type of flow exceeded. However, for the Gulf Sturgeon passage during a specific month(s) of the year, this is not relevant. These results need to be scaled to the total number of days of exceedance compared to the number of days within the season. I believe the USR report did this.	Please adjust to scale the number of days of exceedance for the length of the season identified.	

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11	USR/MSR	Perhaps	<p>Flow requirements for the larval/young-of-year life stage are largely absent in these reports. Specific flows in the month(s) following spawning have been shown to influence recruitment success. For example, Randall and Sulak (2007) found that higher mean monthly flows in September and December were related to increased recruitment in the Suwannee River. These two time periods may correspond to critical young-of-year sturgeon development periods for sturgeon spawned during the spring and fall. Similarly, D'Ercole et al. (unpublished data) found that high flows that inundate the floodplain during the summer period</p>	<p>Additional research is needed to gain a better understanding of the hydrologic conditions that influence Gulf Sturgeon young-of-year survival. However, the previous research outlined in Randall and Sulak (2007) does provide evidence that high flows in September and December were related to recruitment success. The monthly flows during this time period were provided and could be used as a starting point for</p>	

# PEER REVIEW FORM

## SUWANNEE RIVER WATER MANAGEMENT DISTRICT



**Project Name:** MINIMUM FLOWS AND LEVELS ASSESSMENT FOR THE UPPER AND MIDDLE SUWANNEE RIVER

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			increased recruitment success in the Apalachicola River, FL.	establishing minimum flows during post-spawn development periods until additional research could be conducted.	