

Upper and Middle Suwannee River MFL Peer Review

Draft Peer Review Comments for Meeting 3 Scheduled for May 2nd at 1pm

Comments on the USR MFL Report

Gregg Jones, PG, PhD

04/27/23

1) USR Report - Page 31. *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 (Figure 24) occurs at about river mile 170; i.e., near White Springs (Miller, 1986)*

I assume this is referring to 20 feet below land surface to 45 feet below land surface? This should be specified in the report.

2) USR Report – Page 39, Figure 30. The caption for Figure 30 is: *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. Refer to Figure 5 for well locations.]*

I don't understand how the impact can be near zero at White Springs gage given that White Sulphur Springs has mostly ceased flowing.

This text is from page 30: *River discharge is substantially influenced by groundwater inflow downgradient of the Cody Scarp, particularly under low flow conditions. The river becomes a gaining system where the UFA potentiometric surface is higher than river stage. The pre-1960s measurements of White Sulphur Springs discharge characterized a regional groundwater level that resulted in a gaining river system near White Springs at one time. However, hydrologic conditions since the 1970s are such that the USR has become a losing stream in the vicinity of White Springs, as evidenced by the substantial decline in spring flow. Downstream from White Springs, the USR that has been mapped as a gaining reach (Figure 23) and may be transitioning to a losing reach approaching Suwannee Springs, as discussed later in this chapter.*

Since the USR has become a losing stream at White Springs, I don't understand how the net yearly groundwater withdrawal impacts to the Suwannee River at White Springs can be near zero, as shown in Figures 30 and 32.

Might it have to do with the placement of the river flow gauge at White Springs? Is the gage upstream or downstream of where the White Sulphur Springs discharge enters the river? If upstream, it wouldn't catch the flow of White Sulphur Springs so the influence of the historic decline in springflow on river flow wouldn't have been recorded. If downstream, the historic decline in discharge from White Sulphur Springs should have influenced river flow and would be apparent in the river flow data.

3) USR Report Appendix B, Part 2 – Injection Well Hindcasting. The appendix describes how the historic volume of reclaimed water injected into the FAS in Alachua County for injection wells in the NFSEG model was determined. What about injection into the FAS for the rest of the NFSEG domain or at least for the Florida counties that are near enough to the USR to influence it? Was Alachua County the only county in the model domain where injection occurred? If that's the case, it should be made clear in the introduction text of the Appendix.

4) USR and MSR Report - Reference Timeframe. A critical component of establishing a minimum flow for the USR was to develop baseline flow and Upper Floridan Aquifer (UFA) groundwater level records that reflect unimpacted or minimally impacted historical conditions over representative long-term hydrometeorological cycles. In other words, the Reference Timeframe (RTF) is a time-series of Suwannee River flow from which any impacts of groundwater withdrawals are removed. To assist with estimating the impacts of withdrawals on historical flows and water levels, the District and the St. Johns River Water Management District developed the North Florida Southeast Georgia (NFSEG) regional groundwater

The use of a groundwater flow model to determine long-term impacts on USR flow from groundwater withdrawals was a recommendation of the Peer Review Panel that conducted the original review of the USR proposed minimum flow in 2017. I am pleased to see 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.

While I support the District's approach to developing the RTF and recognize the significant complexity of the task, I have the following comment regarding assumptions.

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 inherent 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. My concern is that error inherent in each step is carried forward and compounded in subsequent steps.

Because the RTF flow is integral to the development of the proposed minimum flow, the District should conduct an analysis to evaluate the error inherent in the process to determine whether the degree to which the error affects the calculation of the minimum flows is significant.

5) USR Report Page 120, Figures 74 and 75 and Page 116, Text that's Associated with the Figures. It's not clear to me how to interpret these figures. Please provide more information in the text that explains them.

6) USR and MSR Report, Availability of Water for Water Supply at High Flows. Although I understand this is a report on establishing the minimum flows for the USR, I believe it is important to determine some level of understanding of the availability of water at high flows for water supply. The SWFWD assisted with the development of two large off-stream reservoirs that only harvest water from the rivers to fill the reservoirs 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.

As everyone knows, there are frequent periods when the Suwannee River flows at very high levels. During these periods, water could be pumped from the Suwannee River and stored in an off-stream reservoir for municipal, agricultural, or mining water supply or it could be pumped to high recharge areas to recover depressed groundwater levels in the Floridan aquifer. Of course, something like this could be part of a recovery strategy if one becomes necessary.

I looked at USR Report Figures 72 and 73 to try to get a feel for 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.

I recommend that Figures 72 and 73 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.

7) USR & MSR Report, Drought Considerations. I'm concerned about what the District's approach will be if river flow drops below the established minimums for an extended period of time due to extended drought. Droughts are a natural occurrence not related to groundwater withdrawals. However, groundwater withdrawals, especially for agriculture, will most certainly increase during droughts, which will further reduce river flow. Although the details of how this circumstance will be managed may be part of consumptive use permitting process, the issue should be at least briefly discussed in the District's MFL report.

Memorandum (Draft)

To: SRWMD

From: Adam Munson PhD PE

Date: 4/28/2023

Re: This document provides a brief summary of my MFL peer review form submitted for the Upper and Middle Suwannee River MFL Report.

The District has submitted for peer review MFL reports for both the Middle and Upper Suwannee River systems. The general impression of both reports is positive with obvious care having been taken and attention paid to consistency with previous MFL efforts. Modeling efforts and quantitative analysis continue to evolve and those continued improvements are commendable. In fact most of the ecologic evaluations such as SEFA, floodplain transects and HEC-RAS modeling seem well constructed. Specific to this report the following observations appear most salient.

The one metric limiting water reductions in these reaches is the passage of gulf sturgeon. The standard imposed, a 3 ft by 15 ft passages availability during spawning seasons, is the best available information for protecting the upstream movement of the animal. It's use is reasonable given the limited information. However, the lack of other WRVs near this hydrologic limit suggest that in the long-term better information be developed confirming or refining both the temporal and spatial requirements. As an alternative a sensitivity analysis could determine that the metric is not sensitive to the selection of time or width. Either would solidify the metric used to protect the spawning movement.

In evaluating all metrics the District relies on constructed flows which estimate water flows in the absence of withdrawals. These reference timeframe (RTF) flows are constructed with the help of ground water models and reconstructed historic records. This is reasonable and has been implemented often in MFL development. However, these reports would benefit from greater specificity regarding the hindcasting of some records, especially well data, and the use of the NESEG model. More specifically, the appendix for both reports is not specific to either report. It makes evaluation of any uncertainty related to the RTF adjustment challenging.

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.

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.

Signature of Reviewer:	Date of Peer Review:
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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.

Name and Affiliation of Responder to Peer Review Comments:	
Signature of Responder:	Date of Response:

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Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect	To be completed by Peer Reviewer(s)		To be completed by report author(s)
			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 greatly benefit from actual discussion of the statistics and not just allot of screen captures. This issue is more noticeable because the District in</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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			the MSR has provided a more informative text and used alternate methods.		
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 that 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 represent 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	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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			the reader. By contrast in the MSR I 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 seems to have been</p>	<p>Explain why in the USR the well records</p>	

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			undertaken 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.	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.	
	MSR section 2.7	Yes	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	Expand details of RTF adjustment either in	

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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	I am comfortable that the 3ft of depth is the reasonable and that the 15ft width is at least logical if somewhat untested. 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.		

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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.	
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.	
	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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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

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4. Limitations and imprecision in the information were reasonably handled;
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6. Conclusions based on the procedures and analyses are supported by the data.

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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;
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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.

Signature of Reviewer: 	Date of Peer Review: 4/25/2023
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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.

Name and Affiliation of Responder to Peer Review Comments:	
Signature of Responder:	Date of Response:

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Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Peer Reviewer(s)		To be completed by report author(s)
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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.</p>	

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5	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 at 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 establishing minimum flows during post-spawn</p>	

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			increased recruitment success in the Apalachicola River, FL.	development periods until additional research could be conducted.	
6	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 slow velocity. Flow reductions did not consider changes to holding area habitats 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.	
7	MSR – p.66	No	In the second to last paragraph, it was stated “It is unclear whether the newly	Please clarify.	

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			identified spawning locations are a result of spawning range expansion or advancements in technology allowing for enhanced biological inference." Please explain what technological advancements were being used.		
8	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 actual habitat preferences.	
9	MSR – p. 69	No	In Table3-3, 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.		
10	MSR – p. 79	No	In Table 4-1, there is a column labeled “General Flow Regime”. What does the Low, Medium, and High levels refer to?	Please provide a range of flows for each category.	
11	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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