

# Technical Peer Review—Technical Report- Minimum Flows and Minimum Levels Re- Evaluation for the Lower Santa Fe and Ichetucknee Rivers and Priority Springs

PREPARED FOR



**Suwannee River Water Management District**

PREPARED BY

**BFA** Environmental Consultants  
*Barnes, Ferland and Associates, Inc.*

FEBRUARY 21, 2020

# INTRODUCTION

## OVERVIEW

The Suwannee River Water Management District (District) has included an MFLS re-evaluation for Lower Santa Fe and Ichetucknee Rivers and their associate priority springs in its current priority list and schedule for the establishment of minimum flows and levels (MFLs). based on the provisions of Subsection 373.802, Florida Statutes (F.S.). Also, based on the provisions of this subsection, the District has identified these MFLs independent scientific peer review.

These recommended MFLs are described in a document titled *Minimum Flows and Minimum Levels Re-evaluation for Lower Santa Fe and Ichetucknee Rivers and Priority Springs Draft Report December 2019*, prepared for the District by HSW Engineering, Inc. (HSW).

## APPROACH

Section 373.042, F.S., provides that MFLs shall be calculated using the best information available, that the Governing Board shall consider and may provide for non-consumptive uses in the establishment of MFLs, and when appropriate, MFLs may be calculated to reflect seasonal variation. The law also requires that when establishing MFLs, changes and structural alterations to watersheds, surface waters, and aquifers shall also be considered (Section 373.0421, F.S.). The State Water Resource Implementation Rule (Chapter 62-40, Florida Administrative Code) includes additional guidance for the establishment of MFLs, providing that:

*...consideration shall be given to the protection of water resources, natural seasonal fluctuations in water flows or levels, and environmental values associated with coastal, estuarine, aquatic, and wetlands ecology, including:*

- a. Recreation, in and on the water;*
- b. Fish and wildlife habitats and the passage of fish;*
- c. Estuarine resources;*
- d. Transfer of detrital material;*
- e. Maintenance of freshwater storage and supply;*
- f. Aesthetic and scenic attributes;*
- g. Filtration and absorption of nutrients and other pollutants;*
- h. Sediment loads;*
- i. Water quality; and*
- j. Navigation.*

Section 373.042, F.S., also addresses independent scientific peer review of MFLs, specifying the review of all scientific or technical data, methodologies, and models including all scientific and technical assumptions employed in each model, used to establish a minimum flow or minimum water level. In addition, the law requires that the Florida Department of Environmental Protection (FDEP) or the Governing Board shall give significant weight to the final peer review panel report when establishing the minimum flow or minimum water level.

The main body of this peer review is in three parts per the District's instructions for conducting this review. These three parts are:

- District's Peer Review Forms: signed and dated by the reviewer.
- Table 1 contains detailed review comments
- Table 2 provides summary responses to the District's peer review assessment criteria for the overall quality of MFLs development effort.

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All three parts are attached to this short text document.

Table 1 lists the individual review comments, summarizing the panel member's individual general and specific review comments along with any recommended actions. Each comment is treated as a separate row in these tables. Table 2, the peer review assessment criteria tables, include the panel member's comments concerning the District's peer review assessment criteria.

The District's peer review assessment criteria, addressed by this peer review panel member in the Table 2 are as follows:

1. Determine whether the methods used for establishing minimum flows are scientifically reasonable.
  - A. Supporting Data and Information: Review the relevant data and information that support the conclusions made in the report to determine:
    1. the data and information used was properly collected;
    2. reasonable quality assurance assessments were performed on the data and information;

**Note:** The peer reviewer was not expected to provide independent review of standard procedures used as part of institutional programs that have been established for collecting data, such as the USGS and SRWMD hydrologic monitoring networks.
  - B. Technical Assumptions: Review the technical assumptions inherent in the methodology and determine whether:
    - 1) the assumptions are clearly stated, reasonable and consistent with the best information available;
    - 2) the assumptions were eliminated to the extent possible, based on available information; and
  - 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 all necessary factors;
    - 3) the procedures and analyses were correctly applied;
    - 4) limitations and imprecisions in the information were reasonably handled;
    - 5) the procedures and analyses are repeatable; and
    - 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 Peer Reviewers shall:
  - A. List and describe scientific deficiencies and, if possible, evaluate the error associated with the deficiencies;
  - B. Determine if the identified deficiencies can be remedied.
  - C. If the identified deficiencies can be remedied, then describe the necessary remedies

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and an estimate of time and effort required to develop and implement each remedy.

- 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.

### FIELD INSPECTIONS

I participated in two consecutive one-day field visits to the project area in May 2019. One day on focused on the IR and its priority springs and one day on the lower LSFR and its priority springs. First trip occurred May 22, 2019 focused on the IR and priority springs within Ichetucknee Springs State Park with park naturalist Sam Cole, and District staff Dave Christian and Louis Mantini. Under the expert guidance of Mr. Cole, we visited the IR, Head Spring, Blue Hole Spring, Cedar Head Spring, and Mission Group, Devil's Eye, Coffee, Mill, and Grassy springs.

The second day, May 23, 2019 included a boat and upland access to key suites on the LSFR and IR. This effort was led by environmental scientists Louis Mantini and Robbie McKinney. Sites visited were: Rum Island, Dog Leg Shoals, Col401974, Johnson Springs, Gilchrist Blue, Little Blue, Ginnie Springs group, Devil's Ear, the Ft. White gage, and a SEFA habitat analysis site along the IR.

## SUMMARY COMMENTS

As described, this reviewer's detailed comments are included in a set of two summary tables that capture the two key elements of the District's requested technical review of these proposed MFLs. The first, Table 1 summarizes the reviewer's individual general and specific review comments on HSW's MFLs report along with any recommended actions (Table 1 attached). Each comment is treated as a separate row in this table. Comments are grouped by sections of HSW's document. The report has seven sections and six appendices in a separate document.

Table 2 provides the reviewer's conclusions for each of the District's peer review assessment criteria (Table 2 attached).

This remaining text in this section of the report provides a concise summary of major findings and recommendations from Tables 1 and 2. The key findings have been distilled down to the following 17 items:

1--Overall the proposed re-evaluated MFLs are yet incomplete based on this technical peer review. Very specific problems are identified, and specific recommendations are given to address each problem. These remedial actions if implemented can significantly improve the scientific rigor of this MFLs setting effort.

2--Until the issues identified are resolved, I conclude that this re-evaluation is incomplete. As a result, I cannot currently support the recommended MFLs.

3--The report has a major shortcoming in setting the proper indicators and metrics for several of the fourteen key WRVs elements. This leads me to conclude that reasonable assurance is not provided that the sensitive water resources of the LSFR & IR and their associated springs will be protected by the proposed MFLs.

4--On the question of setting proper metrics for WRV of interest I strongly recommend that whenever relevant and possible protective metrics for the MFLs be based on statistically defined protective hydrological events composed of 1) a magnitude (flow and/or level), 2) continuous duration for the specific inundation or drying period, and 3) with a return interval.

5--Sections 1, 2, 3, and parts of 4 of HSW's report are on solid basis technically. The resource inventories, data and analytical approaches are scientifically reasonable and appropriate, including data collection, development hydrological data time series, surface water (HEC-RAS) modeling, and the development of the reference flow regime are acceptable. The WRV screening process is well done. The general approach to habitat modeling and assessment using SEFA is also excellent. Problematic decisions, however, begin in Section 4.2 Indicators and Response Functions, on page 58 and continue onward to end of document. Summary Table 12 highlights the issue.

6--Major recommendations from 2013 peer review for MFLs that are now being re-evaluated (Graham et al. 2013) have not been followed. Key recommendations from the previous peer review (Graham et al. 2013) were not addressed in the previous peer review for the initial MFLs adopted in 2015. Furthermore, all of these remain problematic in this re-evaluation. These concerns are:

- To prevent significant harm MFLs threshold metrics should include consideration of duration and return interval of both low flow and high flow events in addition to cumulative frequency. They state concerns with the use of flow duration curves (FDCs) alone to characterize the flow

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regime as they may not adequately relate important biological, or ecological responses to variations in the flow regime. Five critical components of flow regime are frequently recognized in the it when assessing environmental flows: 1) magnitude, 2) return interval 3), duration 4), timing, and 5) rate of change

- The Panel recommended that the 15% threshold of change be more fully justified as it applies specifically to the LSF and Ichetucknee Rivers. They found that justification for the proposed threshold of a 15% habitat loss in the establishment of MFLs is based on precedent and cannot be justified based on the data presented in the report. So, while there is a precedent for the adoption of the 15% threshold, its general applicability is unproven
- Panel found that quite different outcomes result from applying the % change method versus events with return intervals. Their Table 1 table is comparison of 15% allowable flow reductions by WRV for LSFR range from 5-8 percent, but change in return interval for WRV events range from 14 to 29 percent, for the IR the numbers are 3-12%, versus 27-45%.
- In the face of uncertainties caused by absence of key supporting data, the panel urged the District to adopt an adaptive management (AM) approach allowing decisions based on limited data to be reinforced or modified as new research and monitoring information become available

7--The report's authors selected and applied only a single approach to setting metrics for WRVs, the 15% allowable change developed by SWFWMD. This is identified as key shortcoming.

8—I advocate that a toolbox of methods be used to screen and select the best approach to setting WRV metrics. The toolbox should include a full array of options available and used by practitioners. Abundant examples exist from numerous from other MFL WRV metrics developed by the SRWMD and other sister districts. In addition, recent technical reviews of the field can help define the contents of the toolbox.

9--An explicit adaptive management (AM) framework is missing, it should be added and used as a guiding principle. This is a repeat of a major recommendation by UF's peer review panel's finding and recommendations from five years ago (Graham et al. 2013).

10--Report lacks an integrated treatment of the sources of uncertainty. Uncertainty issues are discussed throughout the report, and are key to many of key decisions made for choosing methods of analysis, time series data, etc. Management of uncertainty moving forward is not highlighted, and it should be.

11--Sources of uncertainty in this MFL setting process include:

- Groundwater modeling
- Surface water modeling
- Water budget develop
- Reference flow developed for assess impacts of historic consumptive use
- Selection of relevant WRVs
- Water quality
- Effects of climate change
- Other?

12--Report needs to address seasonality issues when they are relevant to defining WRVs and setting their metrics. How seasonality is handled should be stated in the approach for defining WRVs. Seasonality typically adds components of seasonal occurrence and duration of that seasonal window. So, using an event-based metric seems both prudent, and a scientifically

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defensible choice. Also, if this were being done by the SJRWMD, then the event would be defined. I am sure that SJR District has many examples from established MFLs.

14--Analysis by Graham et al. (2013) clearly show that sensitivity of flow and levels reductions can be quite different for WRV threshold metrics set using 15% change versus event metrics that include components of magnitude, duration and return interval (MDR). This strongly advocates for the reevaluated all the relevant WRV for both rivers, and their associated springs.

15--There are clearly identified water quality impairments of concerns in these rivers and springs. These key water quality issues remain largely divorced from consideration in this MFL. Several recent research findings indicate however, that some water quality problems do have link with flow regimes. As WRV metrics will now be assessed anew we may have the opportunity to incorporate meaningful water quality thresholds in one or more WRV metrics.

16--What about impact of climate change? Climate change is not addressed in the document. MFLs are by their nature our estimates of sustainable resource management. If we are indeed in a time of climate change, then the assumptions upon which we base MFL type sustainability may not hold in the future. In statistical hydrology this is a question of stationarity of the statistical populations comprising our climate driven time series data for temperature, rainfall, runoff, aquifer recharge, etc. The consensus of climate experts is that key time series are in flux, that is they are statistically non-stationary. This is another element of uncertainty, it needs to be discussed, and likely impacts identified and planned for.

17--Shortcomings in the approach dictate that methods used to match WRVs to proper indicators and metrics must be better matched with the state of the science. Thus, the authors need to update their literature review, and science for methods used to set minimum flows and levels, specifically the WRV metrics. A very good, very detailed review of the state of science and practices is a recent book **Water For The Environment** (Horne et al. editors, 2017) provides in depth reviews of current status of theory practice, research and application. This book's citation is: Water for the Environment: From Policy and Science to Implementation and Management, Edited by Avril C. Horne, J. Angus Webb, Michael J. Stewardson, Brian Richter and Mike Acreman. Academic Press, 2017, 720 pages.

Chapter 11—Evolution of Environmental Flows Assessment Science, Principles and Methodologies by Poff, N.F., and R.E. Tharme, and A.H. Arthington.

13—Physical Habitat Modeling and Ecohydrological Tools by Lamoureux, N., C.H. Hauer, M.J. Stewardson, and N.L. Poff.

14—Models of Ecological Responses to Flow Regime Change to Inform Environmental Flows Assessments by Webb, J.A., A.H. Arthington, and J.D. Olden.

15—Uncertainty and Environmental Water by Lowe, L., J. Szemis, and J.A. Webb

16 Water Budgets to Inform Sustainable Water Management by Richter, B. and S. Orr

25--Principles of Monitoring, Evaluation, and Adaptive Management of Environmental Water Regimes by Webb, J.A., R.J. Watts, C. Allan, and A.T. Warner.

27--Moving Forward: The Implementation Challenge for Environmental Water Management by Horne, A.C., E.L. O'Donnell, M. Acreman, M.E. McClain, N.L. Poff, A.J. Webb, M.J. Stewardson, N.R. Bond, B. Richter, A.H. Arthington, R.E. Tharme, D.E. Garrick, K.A. Danielli, K.C..Conallin, G.A. Thomas, and B.T. Hart.

## REFERENCES

Graham, W.D., M.W. Clark, M.J. Cohen, T.K. Frazier, and J.B. Martin. 2013. Peer Review of Proposed Minimum Flows and Levels for the Lower Santa Fe and Ichetucknee Rivers and Associated Priority Springs: Final Panel Report, October 11, 2013.

HSW Engineering, 2019. Draft: Minimum Flows and Minimum Water Levels Re-Evaluation for the Lower Santa Fe and Ichetucknee Rivers and Priority Springs. Prepared for the Suwannee River Water Management District, December 2019, 119 p.

Water for the Environment: From Policy and Science to Implementation and Management, Edited by Avril C. Horne, J. Angus Webb, Michael J. Stewardson, Brian Richter and Mike Acreman. Academic Press, 2017, 720 pages.

Chapter 11—Evolution of Environmental Flows Assessment Science, Principles and Methodologies by Poff, N.F., and R.E. Tharme, and A.H. Arthington.

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## PEER REVIEW FORM

SUWANNEE RIVIERE WATER MANAGEMENT DISTRICT

Project or Report Name: Technical Report-Minimum Flows and Minimum Levels Re-Evaluation for the Lower Santa Fe and Ichetucknee Rivers and Priority Springs

**Name and Affiliation of Reviewer: William J. Dunn, Ph.D., Senior Scientist, Barnes Ferland and Associates**

**Discipline specialty/specialties covered by this review: Development of protective metrics for MFLs**

This document is for the use of project Peer Review Chair 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 method 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;

*Note: The reviewers are not expected to provide independent review of 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.*

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.

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 CONTRACTOR 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

CONTRACTOR and Peer Review Chair shall acknowledge the statutory constraints and conditions (Sections 373.042 and 373.0421, Florida Statutes) affecting the DISTRICT's development of MFLs. CONTRACTOR and Peer Review Chair shall also acknowledge that review of certain assumptions, conditions, and established legal and policy interpretations of the Governing Board (hereinafter referred to as "givens") is not included in the scope of work. These givens include:

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

<b>Signature of Reviewer</b> 	<b>Date of Peer Review: February 21, 2020</b>
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**Responders Certification:** The comments and criticisms provided by the Peer Review Chair 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>

**TABLE 1. SUMMARY REVIEW COMMENTS ON MFL DOCUMENTS**

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by 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
G1	General comment	Yes	Overall the proposed re-evaluated MFLs are yet incomplete based on this technical peer review. Very specific recommendations are given to address problems. These actions if implemented can significantly improve the scientific rigor of this MFLs setting proves. Until the issues identified are resolved, I conclude that this re-evaluation is incomplete, and I cannot support the recommended MFLs.	Follow recommendations provided in this peer review.	
G2	General comment	Yes	Shortcomings lead me to conclude that reasonable assurance is not provided that the sensitive water resources of the LSFR & IR and their associated springs will be protected.	Follow recommendations provided in this peer review.	
G3	General comment	Yes	Sections 1, 2, 3, and parts of 4 are on solid basis technically. The resource inventories, data and analytical approaches are scientifically reasonable and appropriate, including data collection, development hydrological data time series, surface water (HEC-RAS) modeling, and the development of the reference flow regime are acceptable. The WRV screening process is well done. The general approach to habitat modeling and assessment using SEFA is also an excellent.  Problematic decisions begin in Section 4.2 Indicators and Response Functions, on page 58 and continue onward to end of document.	Follow recommendations provided in this peer review.	
G4	General comment	Yes	I very strongly recommend that whenever possible protective metrics for the MFLs be based on statistically	Follow recommendations provided in this peer review.	

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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 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
			defined protective hydrological events composed of 1) a magnitude (flow and/or level), 2) continuous duration for the specific inundation or drying period, and 3) with a return interval.		
G5	General comment	Yes	<ol style="list-style-type: none"> <li>1. Major recommendations from 2013 peer review (Graham et al. 2013) have not been followed. Key recommendations from the previous peer review (Graham et al. 2013) were not addressed in peer review process for the initial MFLs adopted in 2015. Furthermore, these remain problematic in this re-evaluation.</li> <li>2. To prevent significant harm MFLs threshold metrics should include consideration of duration and return interval of both low flow and high flow events in addition to cumulative frequency. They state concerns with the use of flow duration curves (FDCs) alone to characterize the flow regime as they may not adequately relate important biological, or ecological responses to variations in the flow regime. Five critical components of flow regime are frequently recognized in the it when assessing environmental flows: 1) magnitude, 2) return interval 3), duration 4), timing, and 5) rate of change</li> <li>3. The Panel recommends that the 15% threshold of change be more fully justified as it applies specifically to the LSF and Ichetucknee Rivers. They find that justification for the proposed threshold of a 15% habitat loss in the establishment of MFLs is based on precedent and</li> </ol>	Peer panel provided specific recommendations for hydrology and for setting metrics for WRV elements.	

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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 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
			<p>cannot be justified based on the data presented in the report. So, while there is a precedent for the adoption of the 15% threshold, its general applicability is unproven</p> <p>4. Comparison of allowable flow reductions based on a 15% decrease in number of days a critical flow is exceeded and the percent change in return interval of a critical event duration that would occur when applying the proposed allowable flow reductions... their Table 1 table is comparison of allowable flow reductions by WRV for LSFR range from 5-8 percent, but change in return interval for WRV events range from 14 to 29 percent, for the IR the numbers are 3-12%, versus 27-45%.</p> <p>5. In absence of key supporting data, the panel urges the District to adopt an adaptive management approach allowing decisions based on limited data to be reinforced or modified as new research and monitoring information become available</p>		
G6	General comment	Yes	<p>The report's authors considered only a single approach to setting metrics for WRVs. Rather as a general approach, a toolbox of methods should be screened for the best available method/approach.</p> <p>Examples are numerous from other MFL WRV metrics developed by the SRWMD and other sister districts.</p>	<p>Follow recommendations provided in this peer review.</p> <p>Toolbox actual ant thought process needs to be developed and used.</p>	
G8	General comment	Yes	<p>Update the science for methods used to set minimum flows and levels, specifically the WRV metrics.</p>	<p>Water for the Environment: From Policy and Science to Implementation and Management, Edited by Avril C. Horne, J. Angus Webb,</p>	

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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 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
				<p>Michael J. Stewardson, Brian Richter and Mike Acreman. Academic Press, 2017, 720 pages.</p> <p>Chapter 11—Evolution of Environmental Flows Assessment Science, Principles and Methodologies by Poff, N.F., and R.E. Tharme, and A.H. Arthington.</p> <p>13—Physical Habitat Modeling and Ecohydrological Tools by Lamoureux, N., C.H. Hauer, M.J. Stewardson, and N.L. Poff.</p> <p>14—Models of Ecological Responses to Flow Regime Change to Inform Environmental Flows Assessments by Webb, J.A., A.H. Arthington, and J.D. Olden.</p> <p>15—Uncertainty and Environmental Water by Lowe, L., J. Szemis, and J.A. Webb</p> <p>16 Water Budgets to Inform Sustainable Water Management by Richter, B. and S. Orr</p> <p>25--Principles of Monitoring, Evaluation, and Adaptive Management of Environmental Water Regimes by Webb, J.A., R.J. Watts, C. Allan, and A.T. Warner.</p> <p>27--Moving Forward: The Implementation Challenge for Environmental Water Management by Horne, A.C., E.L. O'Donnell, M. Acreman, M.E. McClain, N.L. Poff, A.J. Webb, M.J. Stewardson, N.R. Bond, B. Richter, A.H. Arthington, R.E. Tharme, D.E. Garrick, K.A. Danielli, K.C..Conallin, G.A. Thomas, and B.T. Hart.</p>	
G9	General comment	Yes	An explicit adaptive management (AM) framework is missing, it should be added and used as a guiding	Follow recommendations provided in this peer review.	

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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
			principle. This is a repeat of a major recommendation by UF's peer review panel's finding and recommendations from five years ago (Graham et al. 2013).		
G10	General comment	Yes	Report lacks an integrated treatment of the sources of uncertainty. Uncertainty issues are discussed throughout the report, and are key to many of key decisions made for choosing methods of analysis, time series data, etc. Management if uncertainty moving forward is not highlighted, and it should be.	Add a discussion on the major sources of uncertainty, and their respective and collective uncertainty effect on the development of the recommended minimum levels.	
G11	General comment	Yes	Report needs to address seasonality issues when defining WRV and setting their metrics. How seasonality is handled should be stated in the approach for defining WRVs.  Seasonality typically adds components of seasonal occurrence and duration. So, using an event-based metric seems both prudent, and a scientifically defensible choice. Also, if this were being done by the SJRWMD, then the event would be defined. I am sure that SJR District has many examples from established MFLs.	Revise report to include more comprehensive treatment of seasonality. Seasonality as a component of WRV metrics should be expected, or likely based on experience with the applying the WRVs to riverine and spring run systems.	
G12	General comment	Yes	Analysis by others clearly show that sensitivity of flow and levels reductions can be quite different for WRV metrics set using 15% change versus event metrics that include components of magnitude, duration and return interval (MDR).	Follow recommendations provided in this peer review. The District has used event based criteria for setting WRV metrics for MFLs for lakes (Lakes Brooker, Hampton, Santa Fe, and Alto).	
G13	General comment	Yes	Significant revisions to the MFLs setting process for the LSFR, IR and their associated priority springs is needed. The WRV response functions, indicators and metrics used in this report must be re-evaluated, and then revised if warranted. At a minimum this should include significant revision to Sections 4, 5, 6 and 7 of HSW's report. The	Detailed recommendations on how the this do are provided. The District has used event based criteria for setting WRV metrics for MFLs for lakes (Lakes Brooker, Hampton, Santa Fe, and Alto).	

Report

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by 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
			sequence of steps necessary to do this is covered in Recommendations section of this report.		
G14	General comment	Yes	<p>Key water quality issues reflecting the health of these two rivers and their associated springs remain largely divorced from consideration in this MFL. Several recent research findings indicate however, that some water quality problems do have link with flow regimes.</p> <p>As WRV metrics will now be assessed anew we may have the opportunity to incorporate meaningful water quality thresholds in one or more WRV metrics.</p>	Follow recommendations provided in this peer review.	
G15	General comment	Yes	<p>An explicit AM framework for the process is recommended as the tool for addressing and managing uncertainty. Sources of uncertainty in this MFL setting process include:</p> <ul style="list-style-type: none"> <li>• Groundwater modeling</li> <li>• Surface water modeling</li> <li>• Water budget develop</li> <li>• Reference flow developed for assess impacts of historic consumptive use</li> <li>• Selection of relevant WRVs</li> <li>• Water quality</li> <li>• Effects of climate change</li> </ul>	Follow recommendations provided in this peer review.	
G16	General comment	Yes	<p>What about impact of climate change? Climate change is not addressed.</p> <p>MFLs are by their nature our estimates of resource sustainability. If we are in time of change, then the</p>	Follow recommendations provided in this peer review.	

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			<p>assumptions upon which we base MFL type sustainability may not hold. In statistical hydrology this is a question of stationarity of the statistical populations comprising our climate driven time series data for temperature, rainfall, runoff, aquifer recharge, etc.</p> <p>The consensus of climate experts is that key time series are in flux, that is they are statistically non-stationary. This is another element of uncertainty, it needs to be discussed, and likely impacts identified and planned for.</p>		
G17	General comment	Yes	Setting individual MFLs for priority springs is problematic due to uncertainty	Follow recommendations provided in this peer review.	
G18	General comment	Yes	<p>The overall science behind this process of setting environmental flows for the rivers and springs in north Florida needs to be updated. The state of the science is evolving. The field has moved considerably beyond change threshold metrics based solely on a percent allowable change.</p> <p>A good start might be with a recent book Water for The Environment (Horne et al. editors, 2017) provides in depth reviews of current status of theory practice, research and application.</p>	Follow recommendations provided in this peer review.	
	1.0 Introduction: pages1-3 with Figure 1.				
1.1		No	I accept the content of this section. It covers: the rule-based peer review process, the list water resource values	No further action required.	

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			the ten WRVs identified in the Water Resource Implementation Rule (62-40.473, FAC), and an overview of the watershed and study area.		
	2.0 Hydrology: pages 4-28.				
2.1	Page 4	No	First paragraph—I agree starting assumption about approach.	No further action required.	
2.2	Pages 4-8	No	I accept the content of these report sections. Including supporting Figures 2, 3 and 4.	No further action required.	
2.3	Page 8	No	I accept the focus on the Ft. White and US441 on the LSFR, and HWY 27 gage on IR.	No further action required.	
2.4	Page 9, Table 1	No	Most recent gage data I cited as 2015. Is there more recent data that can added? Will extending the respective time series help?	If the most current available data is not being used, then please provide reason why.	
2.5	Page 11	No	Bottom paragraph—states an assumption about LOESS procedure. I agree with the choice of a smoothing parameter of 0.33.	No further action required.	
2.6	Page 12	No	Section covers the need for infilling data series using multiple linear regression (MLR) I concur that need exists, and I concur with the method selected.	No further action required.	
2.7	Page 12, 2.3.3 Watershed Yield	No	I agree that watershed yield is a useful parameter to characterize flow changes in the watershed.	No further action required.	
2.8	Page 13	No	Figures 6 and 7. Figure 6 flow exceedance for Ft White, US441, and Hwy 27 gages. Figure 7 annual average flows at Ft White and Hwy 27 gages. It appears that LOESS is included for Ft White, but this is not labeled, or otherwise indicated.	Please complete the labeling.	

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2.9	Pages 14-15, discussion of AMO	No	2.3.4 Atlantic Multidecadal Oscillation—authors conclude that AMO is not observed in time series. Do I agree? Maybe, I am not certain. Page 15—Figures 8 and 9. Fig. 8 is AMO surface temperature sequence. Figure 9 is flow exceedances for AMO warm vs cool periods for SFR at Ft White and Worthington Springs. Appears to be no apparent AMO effect.	Please confirm that District staff agree with authors conclusion that the AMO cycle is not a strong signal in the data.  Beyond the AMO issues the authors do need to also address the potential effect of climate change on the health of the LSFR and IR, and their associated artesian springs. This is covered in comment G16.	
2.10	Page 14, Section 2.3.5 Rainfall and Air Temperature	No	2.3.5 Rainfall and Air Temperature—first paragraph—agree with use of PRISM? Yes	No further action required.	
2.12	Page 18	No	2.3.6 Groundwater Level—do I agree with choices for GW monitor wells? Yes, I do, but I am interested response by Dr. Motz my fellow panel member and a groundwater modeling expert.	No further action required.	
2.13	Pages 22, Section 2.5 Surface Water Quality	No	Surface water quality: Page 22—Figure 16 in part. Fig. 16 Nitrate levels in LSFR, cited source as Florida Springs Institute (2012). Question—any data more recent than what appears to be 2010?  Next, two locations plotted High Springs and Ft White-both trend lines appear to be declining over period 1987 to 2010.  Also, concentrations at FW look to be twice that at High Springs. Please discuss. 2.5—Surface Water Quality—text covers nitrate issues and	Please provide answers to questions.	

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2.14	Page 23	No	<p>TMDLs, and the FDEP threshold of 0.35 mg/L.</p> <p>Figure 17. Nitrate levels in LSFR springs, source cited as Florida Springs Institute (2012). Question—any data more recent than what appears to be 2010? Data from Seven springs: some trendlines declining others rising. trend lines appear to be declining over period 1990 to 2010. Agree?</p> <p>Also, concentrations at Blue and Ginnie look to be 2-4X that at the remaining 5...agree? So, looks like Blue and Ginnie are not in compliance with th 0.35 mg/L standard. Agree?</p>	Please provide answers to questions.	
2.15	Page 23, Section 2.6 Groundwater Use	No	<p>Content of this section is very important feed into this exercise. For this review however none of it can be verified from what is in the report. That includes the single paragraph of text and supporting Figures 19 and 20.</p> <p>Secondly, it seems that this section should be referencing Appendix B: Water Use Hindcasting.</p>	Add text to reference Appendix B	
2.16	Pages 24-28, Section 2.7 Reference Timeframe Flow	No	<p>Content of this section is very important feed into this exercise. For this review however none of it can be verified from what is in the report. That includes the single paragraph of text and supporting Figure 21.</p>	No further action required	
2.17	Pages 24 and 26, Section 2.7 Reference Timeframe flow	No	<p>Text for intro to 2.7 Reference Timeframe Flow (RTF). I concur with approach to generate the RTF. It appears to be reasonable approach. See the remaining pages in this section and supporting material in Appendix B and C.</p>	No further action required	
2.18	Page 25, Section 2.7.1	No	<p>Figures 19 and 20. Breakout of water use in planning area. Both figures look reasonable.</p>	No further action required	

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	Flow Characteristics				
2.19	Page 27, Figures 22 and 23	No	Figures 22 and 23. Fig 22—flow exceedances for Ft. White and US441. Fig 23 flow exceedances for IR at HWY 27. Plots show that the RTF vs measured flows differ very little. Can hardly see differences.	No further action required	
2.20	Page 28, Figure 24	No	Figure 24--Temporal change in relative difference between RTF and measured flow at FW, US441, and Hwy27. Plots by gage have data overlying each other, so this is difficult figure to interpret. May help to drill down on residuals.	Can clarity of figure be improved?	
	3.0 Biology: pages 29-55				
3.1	Page 29	Yes	<p>3.1 intro to the Conceptual Ecological model. This CES is a simple linear flow diagram of cascading influences. It is an effective visual for this introduction</p> <p>Text for introductory paragraph list of six effects of flow alteration on ecosystems.</p> <p>Text in section 3.1 references Poff et al. 1997, this reference is foundational to the field, but it is a bit old. Suggest that the science update can carry over to the conceptual framing of the biological communities.</p>	<p>Introduction covering the conceptual ecological model in text on pages 29 and 30 and including Figure 25 are acceptable.</p> <p>Consider updating this conceptual overview following the update the science. A more detailed recommendation on how to move this forward is included as comment G8.</p>	
3.2	Page 31	No	Page 31—Figure 26 in part, Conceptual trophic model. This a another very simple trophic pyramid but highlights the major taxonomic groups of aquatic insects the Ephemeroptera, Plecoptera, and Trichoptera (EPS).	Please annotate the figure or legend to make it clear what the arrow flows represent.	

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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
			Arrows in the figure are not labeled, so it not clear what the transfers represent.		
3.3	Pages 37-38	Yes	Table 4, Effects of hydrologic factors on floodplain vegetation. Neither table nor text cover the dewatering and stays-dry end of the full hydrologic regime. This is an oversight that needs to be corrected.	Please revise Table 25 and supporting text to cover the critical need for dewatering events. There are very good review articles covering this topic in detail.	
3.4	Page 39	No	Text 3.4.1 SAV—details of SAV coverage are given, but these are not directly verified. Historic SAV survey covered in reports by FDEP and others.  Figure 33, two maps showing extent of LSFR floodplain wetlands, and 10-year flood zone. Legend shows emergent wetlands, but I do not see that in either of the two figures It would help to know the acreage area values for the different vegetation types displayed.	Can summary acreage value be added to figure?	
3.5	Page 40	No	Figure 34. Extent of IR floodplain wetlands, and Flood Zone A It would help to know the acreage area values for the different vegetation types displayed.	Can summary acreage value be added to figure?	
3.6	Page 41	No	Table 5 in part. List of SAV species identified during a 2017 survey of LSFR (Morris et al 2017). Text following highlights SAV. Notes effect of recreational use on SAV, by the tubers.  Table 4--Check scientific name for Chara. The name scientific name provided appears to be an error.	Please check the Latin name for species, the specific epithet, of Chara. Please an answer the question about long-term drought and potential effects of climate change.	

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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
			<p>Species lists on page 41 lists look good and as complete as needed. Lists are acceptable but cannot be independently verified. Lists comport with my knowledge of these habitats, the rivers and springs of the SR district, and observation from the two field trips in May 2019 covering the IR and LSJR respectively.</p> <p>Final para comments on impacts of recreational use, especially during long-term drought conditions. This begs the question...do the MFLs address this? Do they protect from impact during long-term drought? What about climate change?</p>		
3.7	Page 42	No	<p>Figure 35, Location of SAV transects on IR. Visited a couple of these transects. Number and spatial distribution appear to be a good plan to characterize the habitats in the IR. I visited a number of these transects during field inspection.</p> <p>This page is fine as is.</p>	No further action required.	
3.8	Page 43	No	<p>Figure 36 in part, Upper IR SAV transect summary, from FSI 2016. Figure is a good visual time series summary of SAV dynamics. Shows that species change occurs through time. Note the demise of Chara from 1998 to 2004. Is this significant? Are SAV species interchangeable? Is some better habitat?</p> <p>Several paragraphs of new text covering factors that affect SAV. Last paragraph of page mentions research by Hensley and Cohen 2017 on effect of flow reversals, that is there may be negative effects on algal consumers. This argument may need to be carried forward as explanatory,</p>	Please provide answers to questions.	

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			or exploratory. Authors certainly suggest causal relationship that should be explored further.		
3.9	Page 44	No	Table 6 starts at bottom of page. List of species of fish found in the SFR 1972-2018. There are 50+ species. Table is fine as is.	No further action required.	
3.10	Page 44	No	Begins text on Aquatic Macroinvertebrates 3.4.2. First sentence states these populations in the LSFR are healthy based on water quality and community sampling, the work done by others. Cannot verify by what is in report, I assume that these studies are interpreted correctly for the LSFR and IR	No further action required.	
3.11	Pages 45-46	No	Begin text, 3.4.3 Fish. Basic descriptions of fish sampling on SFR and IR. Table 6 continued listing fish species found in the SFR.  Also, Table 7 in part, Fish species in IR. Some text, 3.4.4 intro to T&E Species. Table 7 is fine as is.	No further action required.	
3.12	Page 47	No	Section 3.4.4 Threatened and Endangered Species. The content of this is fine Table 8. Species deemed likely to be at risk from LSJR/IR flow and water level reductions. Also, paragraph on T&E species. Both Table 8 and text coverage are fine as is, and therefore acceptable.	No further action required.	
3.13	Pages 48-49	No	Lower page begin text on manatee, 3.4.5. Frames manatee habitat as for thermal refuge. Question--should thermal refuge be an event-based criterion, such as SJRWMD does for Volusia Blue Springs?	Pleas provide responses to questions.	

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			<p>Figure 37 mostly, Comparison of water temps in 2017 and 2018 at Blue Hole, The IR, and LSFR. What should we conclude from these data time series summaries?</p> <p>Both figures in Figure 37 look to be fine/acceptable. Cannot independently validate.</p>		
3.14	Pages 50-51	No	<p>Tables 9 and 10. Table 9 manatee counts in LSFR (2005-2018). Table 10 Counts in IR (1992-2018). Cannot independently verify manatee sighting records. Tables are thus acceptable.</p> <p>Table 8 continued in part. Text 3.4.6 on silt snail. Text covers protective criteria for thermal refuge. I agree.</p>	No further action is required.	
3.15	Page 52	No	<p>Text begins, 2.4.6 Ichetucknee silt snail. Biology of species and habitat preference are covered. Cannot independently verify silt snail information. Text is therefore presumed to be accurate, and thus acceptable.</p> <p>Based on observations of Coffee Spring, concur that habitat is quite small. Species designated as species of greatest conservation need by FF&amp;WCC.</p> <p>It is not clear that the species is at risk, but since it is included in this report, then yes, the concern is stated. And I concur</p>	No further action is required.	
3.16	Page 53	No	<p>Text on Oval pigtoe mussel, Gulf sturgeon, Suwannee bass continues. Text covers the basic threat to these species. I concur with these threat assessments.</p>	Please answer question about Suwannee bass.	

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			For Suwannee bass, the basic research cited is 35 years old. Is that OK? Content of page is fine as is.		
3.17	Page 54	No	Figure 40 Extent of gulf sturgeon critical habitat. Figure 40 is a bit confusing as it is reproduced from and references other reports.	Is there a better figure to use in place of this one?	
3.18	Page 55	Yes	Table 11. Seasonality of fish spawning for select species. Brief text on seasonality in section 3.4.10. Figure shows spawning seasons for six major fish species. Should all this seasonal info be captured in the protective events? I say yes.	Please respond to question.	
	4.0 Approach to Setting MFLs: pages 56-74				
4.1	Page 56	Yes	Text 4.0 Approach to setting MFLs, two paragraphs. Last sentence in second paragraph mentions flow duration curves as the organizing idea for assessing hydrologic change. I disagree, as already noted this is too simplistic to protect the flow regime in these rivers and springs, and I know where this leads in the rest of the document. So, this is an opportunity emphasize the hydrologic regime.  I do however concur with this basic coverage of the ten WRVs and the breakout to the 14 WRV elements in Table 12.		
4.2	Page 56	No	Text: 4.0 Intro, two short paragraphs that describe approach. First is mention of the RTFs, and key assumptions: RTFs are protective of the systems and WRVs, and that some amount of water is available within	This MFL setting process must be re-evaluated and updated. At a minimum this should include significant revision to Sections 4, 5, 6 and 7 of HSW's report. The sequence of steps	

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			the RTF regime. Do I agree? Mostly yes. This is the basis of most MFLs for rivers, springs, lakes and wetlands. Second paragraph has a few more key assumptions in how to identify the most relevant WVs. I concur with the approach. Final sentence mentions flow duration curve, which may be a subtle warning	necessary to do this is covered in Recommendations section of this report.	
4.3	Page 57	Yes	Section 4.1.8, WRV 8 sediment loads—report notes that there is lack of data regarding sediment loads for these rivers. This is uncertainty issue. Do they eventually make recommendations for reducing uncertainty? Does the uncertainty make this WRV less valuable? Less Reliable?	Please provide answers to questions.	
4.4	Page 58	No	Section 4.2, Indicators and response functions. I generally agree with the examples they have listed. And these carry over to the details in Table 12.	No further action required.	
4.5	Pages 60-61	Yes	Table 12 Selected indicators, response functions, and MFLs assessment metrics for WRVs Table 12 Table is the creation of each indicator for each WRV selected. I concur with the content of the first two columns, the indicators, and their relevance. The next two columns become more problematic: the WRV's response function, and its metric. Authors choose an across the board percent change approach to response functions and metric for all 14 proposed protective metrics. I strongly disagree with the % change approach.	This MFL setting process must be re-evaluated and updated. At a minimum this should include significant revision to Sections 4, 5, 6 and 7 of HSW's report. The sequence of steps necessary to do this is covered in Recommendations section of this report.	

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4.6	Pages 62-63	No	<p>Section 4.3 HEC-RAS Modeling: I agree with choice of HEC_RAS model. I have no sound technical reason to reject the choice.</p> <p>Text, 4.3.1 HEC-RAS Modeling. See also Appendix D Text, 4.3.1.1 Model development—I accept the choices and assumptions made for selection of HEC-RAS model, model development, and model revisions from the version used for the previous MFL.</p>	No further action required.	
4.7	Page 64	No	Text, coverage of calculating values of model fit, based on Nash & Sutcliff 1970). I agree with the method.	No further action required.	
4.8	Page 65	No	<p>HEC-RAS model</p> <p>Second paragraph, I do agree with premise laid out on ranking and acceptance of efficiency coefficient values.</p> <p>I find that Section 4.3 for the report is general summary of the more extensive coverage of the HEC_RAS model in Appendix D. I do not identify any inconsistencies between this text and Appendices D and D1.</p>	No further action required.	
4.9	Page 65	No	It appears that the HEC-RAS used for the initial MFLs is revised here. If so, then does the update address the issues raised by Graham et al. (2013)? Is uncertainty being addressed in the model revision process?	Please answer the questions.	
4.10	Page 66	No	<p>I find that text in report agrees with information that is presented in more detail in Appendix D.</p> <p>Table 13 presents the Final Transient Model Results. I have no reason to doubt the veracity of results presented</p>	No further action required.	

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4.11	Page 67	No	<p>Table 14: Nash Sutcliff coefficient of model fit efficiency for streamflow gages on LSFR and IR. Table 15 Proportion of all simulated value daily water depths values within 10, 15 and 20% of the measured values of Nash-Sutcliff coefficients.</p> <p>Content of both tables is acceptable as is.</p> <p>For Table 15 what problems and/or uncertainties arise from the two gages rated as unsatisfactory?</p>	Please answer the question.	
4.12	Page 68	No	<p>Section 4.3.1.3 HEC-RAS Steady State Model Development and predictive simulations: I agree with use of the steady state model to generate the flow profiles that follow in Figure 43.</p>	No further action required.	
4.13	Page 69	No	<p>Figure 43, two-part plot of flow profiles for select non-exceedance frequencies for LSFR and IR, respectively. Cannot independently verify, so I accept as</p>	No further action required.	
4.14	Page 70	No	<p>Figures 44 and 45. Figure 44, steady state water profiles for select flow non-exceedance for LSFR. Figure 45, steady state water profiles for select flow non-exceedance for IR. Cannot independently verify, so I accept as valid representations.</p>	No further action required.	
4.15	Page 71-73	Yes	<p>As a general comment on SEFA I support the use of this habitat analysis method. SEFA is a good choice. SEFA is much highlighted in the Horne et al. 2017 review volume.</p>	In general, the use and application of SEFA is acceptable.	

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			Next, I found that the SFA analyses presented are scientifically reasonable, and reproducible, for: 1) taxa-species-life stage used 2) transect locations, and 3) data inputs from the HEC_RAS model	If habitat relevant WRVs must be reevaluated, then SEFA analyses will likely have to be re-done too. Findings, outcomes and recommendations may change as result.	
4.16	Pages 73-74	Yes	<p>Text, 4.4 MFLs Assessment Methods. I have significant disagreement on methods used. Beginning in third paragraph, the adoption of the % change method is invoked. The final sentence in the paragraph claims that this is an event-based approach, citing Neubauer et al. 2008. I find this misleading. The two methods are quite different. I explain this in detail elsewhere.</p> <p>Text continues MFLs Assessment Method. I have significant disagreement on methods used. Significant disagreement in choice made to use only frequency change criteria for WRV indicators. And adoption of SWFWMD's 15% allowable change. Authors make no mention of other approaches, such as event based. In fact, text on the event-based method that was included in the April draft document has been deleted. In addition, Graham et al. 2013 included a major recommendation for change to approach for setting metrics for a group of the WRVs. Their recommendation was not acted on then, and so remains relevant still.</p> <p>Finally, in Poff et al. 2017 review of the state of science in setting environmental flows shows that frequency change measures are much earlier generation of hydrologic change method. The simple frequency change method has shortcomings that are better addressed by event-based</p>	<p>This MFL setting process must be re-evaluated and updated. At a minimum this should include significant revision to Sections 4, 5, 6 and 7 of HSW's report. The sequence of steps necessary to do this is covered in both the Recommendations section of this report, and in General comments 1 through 18 above.</p>	

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			methods that can address more detailed aspects of the hydrologic regime.		
	5.0 Evaluation of WRVs, Section 5, pages 75-98				
5.1	Page 75	Yes	<p>Figure 47 Threshold flow translation between Ft White and US441 (percent of time that flow is exceeded). It is helpful to see all the threshold flows for both rivers arrayed on FDCs from their respective RTFs. So, the figure itself is an illustrative visual. But where did the threshold values come from? The threshold values were not directly presented in Table 12.</p> <p>I agree with assumption regarding level of protection WRVs provide to the river and spring systems state in the first paragraph.</p> <p>Second paragraph: I accept the method used for the translation of threshold flows from US441 to Ft. White gage.</p> <p>Text indicates the emphasis of the percent change approach using flow duration curves (FDCs). I do not agree with the reliance upon this approach for all WRVs. This is a major problem with this how the WRV indicators and measurement metrics are developed for this set of MFLs.</p>	<p>This MFL setting process must be re-evaluated and updated. At a minimum this should include significant revision to Sections 4, 5, 6 and 7 of HSW's report. The sequence of steps necessary to do this is covered in both the Recommendations section of this report, and in General comments 1 through 18 above.</p>	
5.2	Page 76	Yes	<p>Text for Section 5.1 Recreation In and On the Water. This is where HSW's approach becomes problematic. Authors assume that the % change approach is best method, and</p>	<p>This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in both the</p>	

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			<p>that the threshold for significant harm can be defined using the SWFWMD's 15% allowable change.</p> <p>This is the first WRV covered, but the same format is carried through the other WRVs/indicators selected in Section 4 and detailed in Table 12.</p>	<p>Recommendations section of this report, and General comments G1 through 18, above.</p>	
5.3	Page 76	Yes	<p>Text on page includes 5 paragraphs on WRV1 for the LSFR. Several assumptions are given with which I agree:</p> <ul style="list-style-type: none"> <li>• Paragraph 1—general guidance available from paddlers guides</li> <li>• Paragraph 2—allowable change defined by change in time, that is amount of time the activity is precluded. As an application of the %change method, then this sounds like a standard application.</li> <li>• Paragraph 3—define passage for paddling, boating and tubing.</li> </ul>	<p>This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 through 18, above.</p>	
5.4	Page 77	Yes	<p>Report section addressing the IR: Text on IR notes that impacts to SAV beds are most worrisome and have been since early work by Charlie Dutoit in 1979. Tubing season is Memorial Day to Labor Day. Paragraph 2 notes critical concern over extreme low water conditions—does this warrant an extreme low water protective regime?</p>	<p>Please answer the question.</p>	
5.5	Page 78	Yes	<p>Table 17. Flow reductions associated with 15% decrease in exceedance for paddling/boating/tubing. Key assumptions in this analysis is problematic. And it does not seem that the Threshold for tubing on the IR covers the</p>	<p>Please answer the questions.</p> <p>This MFL setting process must be re-evaluated and updated. The sequence of steps necessary</p>	

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			<p>seasonality of use. Shouldn't it? Should it be an MDR event?</p> <p>Text, top one third of page. Second paragraph covers the threshold estimates under RTF conditions. Do I agree?</p> <p>Yes.</p>	<p>to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.</p>	
5.6	Sequence of Ten Tables on various pages	Yes	<p>Ten tables covering the WRVs are or may be problematic. Included are:</p> <p>Table 17, page 78</p> <p>Table 19, page 80</p> <p>Table 20, page 81</p> <p>Table 23, page 86</p> <p>Table 24, page 87</p> <p>Table 25, page 88</p> <p>Table 26, page 90</p> <p>Table 27, page 91</p> <p>Table 28, page 92</p> <p>Table 29, page 94</p>	<p>This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.</p>	
5.7	Page 79	Yes	<p>Figure 49, RTF flow duration curve depicting threshold flows protective of paddling on the LSFR at FW. Content of this figure is acceptable if the % change method is appropriate metric here for flows protective of paddling.</p>	<p>This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.</p>	
5.8	Page 80	Yes	<p>Text, 5.2 Fish passage, 5.2.1 Fish Passage. Paragraph 2 defines fish passage conditions. I concur with depth and width recommendation.</p> <p>Table 19—Flow reductions associated with 15% decrease in time that threshold stages for fish passage on LSFR and IR were exceeded. If %change metric is valid, then this presentation is acceptable. I cannot verify that values in</p>	<p>This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.</p>	

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			table were entered properly, but values look correct based on the array of threshold plotted for LSFR and IR in Figure 47, page 75.		
5.9	Pages 80-81	Yes	Text, 5.2.2 Gulf Sturgeon Passage covers two paragraphs. First paragraph covers recommended channel depth and width for sturgeon passage. I concur with these habitat values.  Question—what do sturgeon do between the two spawning periods? Does the downriver movement of juveniles require protection? Other life stages? Spawning habitat?	Please answer the questions regarding spawning.  This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.10	Pages 80-81	Yes	Question—in general how should seasonality issue be handled? Seasonality adds another component of seasonal occurrence and duration. So, using an MDR event makes a lot of sense. Also, if this were being done by the SJRWMD, then the event would be defined. I am sure that SJR District has many examples from established MFLs.	Please answer the questions.	
5.11	Pages 80- 81	Yes	Last para estimates the critical flow threshold associated with criterion for LSJR at FW and US441 gages. I accept these values as estimated.  Table 20 Flow reductions associated with 15% decrease in time that threshold stages for Gulf sturgeon passage on LSFR and IR were exceeded. Since an MDR event may be useful here, I note that the %change approach collapses a lot of detail that may be important. Spawning season is two part and must be captured. Also begs the question as to need for protection of other life stages of the Gulf sturgeon,	Please answer the questions.  This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	

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			and quantity and quality of spawning habitat. When do young move down to estuary or coast?		
5.12	Page 81	No	<p>Text bottom of page, 5.2.3 Instream Habitat, this is the SEFA habitat modeling and assessment step. I agree with choice of SEFA as the habitat analysis tool. SEFA is also a broadly supported habitat analysis tool by series of authors in Horne et al. 2017. The multiple authors in this volume are enthusiastic supporters and users of SEFA and its historical evolution from PHABSIM.</p> <p>Six sites selected SEFA modeling, four on LSFR and two on IR. Site selection is acceptable</p>	No further action required.	
5.13	Pages 83	Yes	<p>Table 21 General characteristics of LSFR SEFA Sites. Table is acceptable as is.</p> <p>SEFA Site Characteristics—basic descriptions of LSFR SEFA sites. Text acceptable, no problems.</p> <p>Two paragraphs on SEFA sites are acceptable</p> <p>Text, Flow Reduction Assessment, one paragraph. Assessment method explained. I question the %change approach on this. Need to drill down on this some more, Big point is that an MDR, or other approach was not considered. So, is the %change method appropriate for this use?</p>	<p>Please answer the questions.</p> <p>This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.</p>	
5.14	Page 84	Yes	Text covers six paragraphs on SEFA. SEFA analysis gets boiled down to allowable 15% reduction average weighted	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations	

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			score (AWS) for each species and life stage at each SEFA site. I find this approach to be problematic.  Beyond the problematic application of the % change method, the remaining summary on how the mechanics of the SEFA modeling and analysis was performed is acceptable.	section of this report, and General comments G1 though 18, above.	
5.15	Page 84	Yes	Section 5.2.4 Woody Habitat begins at bottom of page. First paragraph provides summary of the importance of woody habitats in these flowing water systems. I concur with this summary.  Question—can this be developed as an event-based MDR metric?	Please answer the question.  This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.16	Page 85	Yes	Table 22, Basis for SEFA based hydrologic shifts for LSFR at FW and US441 gages. Table has a seasonal window of April to July in reference to SEFA analyses, why is that? Also, table has five footnotes detailing how values were estimated. All five are individually and collectively logical in this use. If any step is called into question, then the value of these estimates must be reviewed.	Please answer the question.  This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.17	Page 85	Yes	Text has three paragraphs on woody habitat quality evaluation. Paragraph 1—this paragraph lays out why this WRV should be an assessed using an MDR metric I agree with arguments for importance of magnitude of inundation + duration + seasonality issues. All these critical components however are not addressed by the % change method. By contrast MDR metrics will capture these components of the hydrologic regime.	Please comment on the recommended action.  This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	

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			<p>Paragraph 2—more detail on the ecological functions provided by woody habitats, such as submergent and emergent woody habitats. Again, this difference can be accomplished with an MDR metric.</p> <p>Paragraph 3—agree that data for three locations were reviewed. The 15% change is problematic. So, I do not agree that the threshold values applied are the best available for the protection of woody habitat.</p> <p>The choice of method and metric may be problematic. This choice should be re-evaluated. Specifically, the authors should use a metric that addresses magnitude, duration, seasonality and return interval.</p>		
5.18	Page 86	Yes	Table 23 Flow reductions associated with 15% decrease in time that threshold stages for woody habitat sustainability on LSFR and IR were exceeded. The 15% presumption method is problematic. Thresholds are problematic.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.19	Pages 86	Yes	<p>Text, 5.2.5 Manatee Thermal Refuge, text covers two short paragraphs:</p> <p>Paragraph 1—temperature data used. But again, it seems that this manatee protection metric needs to be an MDR metric that addresses seasonality and return. The return interval is likely annual, but that can be verified by manatee experts. See also the SJRWMD work on manatee protection for Volusia Blue Springs, that will be event based.</p>	<p>Please comment on the recommended action.</p> <p>This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.</p>	

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			Paragraph 2—15% change is problematic. So, I do not agree with the thresholds developed. Strongly recommend that authors consider using the manatee thermal refuge event developed by SJRWMD for the Blue Spring in Volusia County.		
5.20	Page 87	Yes	Table 24 Flow reductions associated with 15% decrease in exceedance corresponding to manatee thermal threshold flow on IR. 15% change is problematic. So, I do not agree with the thresholds developed. Strongly recommend that authors consider using the manatee thermal refuge event developed by SJRWMD for the Blue Spring in Volusia County.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.21	Page 88	Yes	Section 5.2.6 Floodplain Habitat—Based on my own experience strongly recommend that the two critical structural features of floodplain habitat, the vegetative communities and hydric soils should be protected by MDR metrics.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.22	Page 88	Yes	Table 25, Threshold flows for four predominant vegetative types in LSFR floodplain. The %change method used is particularly problematic for the floodplain system. The MDR criteria from SJRWMD should be applied for each relevant community type, and cover the typically relevant MFLs for infrequent high (IH), frequent high (FH), minimum average (MA, and frequent low (FL), etc.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.23	Page 88	Yes	Text, floodplain, two paragraphs—I strongly disagree with 15%change method. Bottom of page, text on 5.2.7 Hydric soils. Absolutely disagree with method used and request MDR following	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations	

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			SJRWMD methods. Many examples exist covering application to floodplain hydric soils on rivers and springs throughout north and central Florida.	section of this report, and General comments G1 though 18, above.	
5.24	Page 89	No	Figures 52 and 53. Figures are explanatory and are fine as is.	No further action required.	
5.25	Pages 90	Yes	Table 26, Flow reductions associated with 15% reduction in time of threshold flows for the four predominant vegetation types in the LSFR floodplain at FT. White and US441.  I strongly disagree with this analysis. Do the MDR following SJRWMD methods, then compare.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.26	Page 91	Yes	Table 27 in part, Flow reductions associated...threshold flows for hydric soils in LSFR and IR floodplains  I strongly disagree with this analysis. Do the MDR following SJRWMD methods, then compare.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.27	Page 91	Yes	Text for Section 5.2.8 SAV. Three paragraphs on SAV communities in IR.  I strongly disagree with this analysis.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.28	Page 92	Yes	Table 28, I strongly disagree with this SAV analysis. Please apply the MDR events following SJRWMD methods, then compare.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	

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5.29	Pages 93	Yes	<p>Sediment and load classification categories (FISRWG 1998). Figure is acceptable, looks to be from a standard reference, cited as FISRWG 1998.</p> <p>Text includes two paragraphs on sediment loads. Para 2—describes the 15% change threshold applied to bankfull discharges. I am not sure that I agree with this choice. And so, I ask if an MDR event-based approach is better? I recall the SJRWMD using a mass sediment balance method on the Silver River. To that end I ask Is a mass balance approach needed for long term sustainability? What other approaches have been used by the district's for sediment dynamics?</p>	<p>Please answer the questions.</p> <p>This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.</p>	
5.30	Page 93	Yes	<p>Text, 5.4 Water Quality. Water quality is addressed in two short intro paragraphs.</p> <p>Water quality remains a significant issue of concern in both rivers and all artesian springs. Document side steps this issue for the most part. The relegation of water quality issues to the realm of TMDLs and BMAPs does not benefit the LSFR and IR, and their associated springs.</p>	<p>Please consider addressing water quality impairments and their known relation to the flow regime of these rivers and spring runs. Impairments and flow reductions are both threats to the sustainability of these spring and river systems.</p> <p>There is then an opportunity to do this comprehensive assessment of relationship between flow regime and water quality.</p>	
5.31	Page 94	Yes	<p>Figure 55 and Table 29. Figure 59, Lane's diagram of balance of dynamic river forces effects on sediment load. Figure acceptable, it is illustrative one from Rosgen 1996</p> <p>Table 29 Flow reductions associated with 15% decrease in time that viable bankfull flows in LSFR and IR are exceeded. As with similar comments on several previous</p>	<p>Please answer the questions.</p> <p>This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.</p>	

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			WRV metrics, these thresholds were developed using the 15%change metric. If that is valid, then all of this is OK. But I ask if the sediment issues are best handled with an MDR metric, or something else? It seems that the sediment load issue is addressed on many flowing water MFLs (SR, SWF, and SJR WMDs) so it would be helpful to check/survey those.		
5.32	Page 95	Yes	Text page, 5.5 Resources Upstream from US441. First of two full pages of text covering the topic. Four paragraphs on this page. I agree with rational and detail provided in support of protection of resources upstream from US441.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.33	Page 97	Yes	Text page includes five paragraphs on resources upstream of US441. Method described for proportioning flows seems reasonable and logical.	Recommend that WRV metrics selected to protect the upstream resources be appropriately chosen.  This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
	6.0 River MFLs Development, Section 6, pages 99-107				
6.1	General comment	Yes	For the numerous reasons already enumerated in comments on sections 4 and 5 of the report I cannot approve of the approach chosen to define most of WRV metrics used in the critical sensitivity analysis. Because of this, then I cannot approve of the respective MFLs developed.	This MFL setting process must be re-evaluated and updated. At a minimum this should include significant revision to Sections 4, 5, 6 and 7 of HSW's report. The sequence of steps necessary to do this is covered in	

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			<p>If my recommendations are followed then many key WRV metrics for both rivers will be redefined as MDR events, following the SJRWMD method, and possibly some other forms too. District has applied these event metrics to floodplain communities and hydric soils on lake MFLs.</p> <p>Analysis by Graham et al. 2013 clearly show that we get strikingly different results for floodplain wetland communities and their associated hydric soils using proposed 15% change versus MDR metrics. They point out that in their test case, the MDR metrics were much more sensitive to flow reductions compared to the proposed 15% change metric</p> <p>So, at this stage of the peer review process I find that I cannot support the proposed MFLs as being protective of the LSFR and IR and their associated springs and providing strong assurance that the thresholds for significant harm for all WRVs will be scientifically sound.</p> <p>I am very confident however that a re-evaluation of this re-evaluation can address the shortcomings found. My full list of recommendations is given elsewhere.</p> <p>My remaining comments on Section 6 follow below, all with the caveat that if WRV analysis is redone as recommended then results are likely to be different.</p>	<p>Recommendations section of this report, and General comments G1 through 18, above.</p>	
6.2	Page 99	Yes	<p>Section 6.0 River MFLs Development, 6.1 Introduction: Four paragraphs provide summary of the sensitivity of MFL metrics, and the most limiting one. This is distillation of</p>	<p>This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations</p>	

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			<p>results from Section 5. Text cites Tables 30, 31, and 32, and Figures 57, 58, 59.</p> <p>I don't concur with this since I do not approve of the approach chosen to define most of WRV metrics used in the sensitivity analysis.</p> <p>I am confident however that a re-evaluation of this re-evaluation can address the shortcomings found.</p>	<p>section of this report, and General comments G1 through 18, above.</p>	
6.4	Page 99	Yes	<p><b>Note: It is my expectation that once the WRV analyses are redone, then the revised MFLs for the LSFR and IR will be quite different. As part of this next level review I include the following evaluation of this section of the report:</b></p> <p>Document states that woody habitat and hydric soils are the most conservative WRVs with hydrologic shifts of 10cfs at the Hwy 27 gage.</p> <p>I don't concur with this since I do not approve of the approach chosen to define most of WRV metrics used in the sensitivity analysis.</p> <p>As noted, if my recommendations are followed then many key WRV metrics for both rivers will be redefined as MDR events, and maybe some other forms too.</p> <p>So, at this stage of the peer review process I find that I cannot support the proposed MFLs as being protective of the LSFR and IR and their associated springs and providing strong assurance that the thresholds for significant harm for all WRVs will be scientifically sound.</p>	<p>This MFL setting process must be re-evaluated and updated. At a minimum this should include significant revision to Sections 4, 5, 6 and 7 of HSW's report. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 through 18, above.</p>	

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			I am confident however that a re-evaluation of this re-evaluation can address the shortcomings found.		
6.5	Page 100	Yes	<p><b>Note: It is my expectation that once the WRV analyses are redone, then the revised MFLs for the LSFR and IR will be quite different. As part of this next level review I include the following evaluation of this section of the report:</b></p> <p>Page 100—Table 30 in part, Summary of WRV metrics and hydrological shifts for the LSFR at Ft. White gage. Table 30 is a good summary for 15% change metric, but I strongly disagree with HSW's choice to apply across the board for All WRV metrics. There are 13 WRV metrics listed in Table 30: 1) paddling, 2) boating, 3)sturgeon spring and fall spawns, 4) general fish passage and general instream habitat, % time, and 5) SEFA, 6) woody habitat, 7) woody habitat snags, 8) hardwood swamp, 9) cypress swamp, 10) hardwood cypress, 11) hydric hammock, 12) hydric soils, and 13) sediment loads. All thirteen can be and have been developed and applied as MDR metrics. All should be evaluated as candidates for an MDR metric. I feel very strongly that the five floodplain habitat elements/components, covering the four dominant vegetative communities and hydric soils, should be MDR metrics. Previous comments have noted that SJRWMD has applied MDR metrics to all 13. This re-evaluation is critically needed.</p>	This MFL setting process must be re-evaluated and updated. At a minimum this should include significant revision to Sections 4, 5, 6 and 7 of HSW's report. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 through 18, above.	

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			For Table 30 the smallest, therefore most conservative hydrologic shifts are for general fish passage at 103-115 cfs, but cypress swamp is not far off at 110 cfs. See hydrologic shifts plotted by WRVs in Figure 60. This indicates that recasting WRV criteria as MDR may have an impact.		
6.7	Page 101	Yes	<p><b>Note: It is my expectation that once the WRV analyses are redone, then the recommended MFLs for the LSFR and IR will be quite different. As part of this next level review I include the following evaluation of this section of the report:</b></p> <p>Table 31, Summary of WRV metrics and hydrologic shifts for the LSFR at US441 gage. This table, like the previous one Table 30, is deeply problematic for the same reasons as noted above in comments for page 100, above.</p> <p>For Table 31 the smallest, therefore most conservative hydrologic shifts are for general fish passage at 53 cfs, but cypress swamp is not far off at 110 cfs. See WRVs plotted with hydrologic shift on Figure 61. This may indicate that recasting WRV criteria as MDR may have an impact.</p>	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
6.8	Page 102	Yes	<p><b>Note: It is my expectation that once the WRV analyses are redone, then the recommended MFLs for the LSFR and IR will be quite different. As part of this next level review I include the following evaluation of this section of the report:</b></p> <p>Table 32 and Figure 57.</p>	<p>Please answer question regarding omission of wetland plan communities.</p> <p>This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.</p>	

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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
			<p>Table 32, Summary of WRV metrics....IR at Hwy 27 gage. For Table 32 there are four WRV metrics with low hydrologic shifts in range of 10-15 cfs, these are woody habitat, hydric soils sediment loads and SAV. See hydrologic shifts plotted by WRVs in Figure 62. This indicates that recasting WRV criteria as MDR may have an impact.</p> <p>Table 32 does not include WRV metrics for floodplain vegetation. And subsequently these are not included in plot on Figure 62. The IR flood plain does indeed support these wetland plant communities. Why are the wetland community types not included?</p> <p>Figure 57, Flow duration curves and WRV metrics determined for LSFR at Ft. White gage. For reasons enumerated already above, I do not concur with the all the content of either table or figure. The placement of the WRV metrics on the FDC is helpful. It provides a means of comparison with other river and springs in the Florida, across the SR, SWF and SJR districts.</p>		
6.9	Page 103	Yes	<p><b>Note: It is my expectation that once the WRV analyses are redone, then the recommended MFLs for the LSFR and IR will be quite different. As part of this next level review I include the following evaluation of this section of the report:</b></p>	<p>This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.</p>	

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			Page 103—Figures 58 and 59. Flow duration curves and WRV metrics for LSFR at US441, and IR at Hwy 27 gages, respectively For reasons enumerated already above, I do not concur with the all the content of either figure.		
6.10	Page 104	Yes	<p><b>Note: It is my expectation that once the WRV analyses are redone, then the recommended MFLs for the LSFR and IR will be quite different. As part of this next level review I include the following evaluation of this section of the report:</b></p> <p>Page 104—Figures 60 and 61. WRV hydrologic shifts at the Ft. White and US441 gages, respectively. These figures plot hydrologic shifts provided in Tables 30 and 31, respectively. Visual picture given is useful, but I don't agree with much of the basis. Again, for reasons enumerated already above, I do not concur with the all the content of either figure.</p>	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
6.11	Page 105	Yes	<p><b>Note: It is my expectation that once the WRV analyses are redone, then the recommended MFLs for the LSFR and IR will be quite different. As part of this next level review I include the following evaluation of this section of the report:</b></p> <p>Page 105—Figure 62 and Table 33. Figure 62, WRV hydrologic shifts at the Hwy 27 gage. Table 33, RTF and MFL flow values at the medians for the LSFR and IR. Based on the % change metric which I do not support. Also, there is no discussion on the</p>	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	

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			<p>relevance/significance of the 10 cfs limit for IR. Within the range of error, this may mean that the MFL is at its threshold.</p> <p>MFLs for IR are problematic for a number of concerns: 1) wrong assessment metric applied to some WRVs, 2) floodplain vegetative communities left out of list of relevant WRVs, but they are included for both LSFR MFL sites, Ft White and US441, and 3) no discussion the significance of the 10 cfs estimate of available water. If the estimate is this close to limit, what is the uncertainty? Does this imply that the UFA is at its limit? What if WRV metrics that are recast as MDR are found to be exceeded? That could trigger a recovery plan.</p> <p>Text begin 6.2.1 Summary. Highlights the 15% change metric, which I do not support.</p>		
6.13		Yes	<p><b>Note: It is my expectation that once the WRV analyses are redone, then the recommended MFLs for the LSFR and IR will be quite different. As part of this next level review I include the following evaluation of this section of the report:</b></p> <p>Section 6.2.3 Future Considerations. Provide four bulleted examples of ongoing work. This is a big opportunity to give the AM uncertainty reduction efforts. But that is not what this is. I would expand this considerably.</p>	<p>Expand future considerations into part of a more comprehensive analysis of uncertainty with recommendations for reducing effects in future.</p> <p>This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.</p>	
6.15		Yes	<p><b>Note: It is my expectation that once the WRV analyses are redone, then the recommended MFLs for the LSFR and IR will be quite different. As part of this next level review I include the following evaluation of this section of the report:</b></p>	<p>This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.</p>	

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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
			Section 6:3 Future Considerations Overall, I conclude that MFLs development for the LSFR and IR watersheds, including the priority springs, is incomplete. Specific recommendations are made to address the concerns raised. Many comments made throughout the document, but very strong recommendations for further work on the WRV metrics. Until this re-evaluation is completed, I cannot endorse the MFLs as proposed. I expect that this will result in some changes to the metrics, and therefore with an array of other dependent factors, like the amount of water potentially available without violating MFLs.		
	7.0 Priority Springs Assessment and MFLs Development, Section 7, pages 108-114				
7.1	Page 108	No	Text, 7.1 Priority Springs Description. Three short paragraphs. Content of all three paragraphs and Table 34 is acceptable, no changes required	Content is acceptable as is, no corrective is action required.	
7.2	Page 109	No	Figure 63 is a conceptual model of hydraulic spring-flow regimes. This is a very helpful conceptual summary of interactions possible between surface and groundwater.	Content is acceptable as is, no corrective is action required.	
7.4	Page 111	Yes	Table 35, Number of zero and negative spring flow measurements. This appears to be a new parameter to use	As part of the re-evaluation recommended these low and no flow issues at the priority springs	

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			to assess conditions at springs based on some new research.	should be explored more thoroughly. This a new element of uncertainty.	
7.5	Page 114	Yes	<p>Page 114—text page, 2.3.1 Proposed MFL Rule Language. HSW takes a big punt on setting MFLs for the 11 individual springs, due to uncertainties, best way to afford protection is to group the priority springs together collectively for a defined river reach such that river hydrology at a reference gage is maintained. So, they mimic the river MFLs for LSFR at Ft. White, and IR at Hwy 27. Each set as median flow with some estimated percent reduction for the respective RTFs. The estimated headroom of available water these medians are 103 cfs (8.1%) for LSFR, and 10 cfs (2.8%) for IR. WOW, the values for the IR at the limit. Does this mean that the system is at the limit of potential for harm?</p> <p>Also need to consider that the headroom estimates may look different if some key WRV metrics, such as for the floodplain vegetative communities and hydric soils, are changed to MDR metrics.</p>	<p>Please answer the questions regarding potential exceedance of WRV metrics.</p> <p>This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report.</p>	
7.6	Page 114	Yes	<p>Section 7.3.2 Future Consideration to Support Spring-Specific MFLs: Six bulleted examples are given. I agree with the six recommendations.</p> <p>I note that water quality, however, is not addressed. Setting MFL setting in this impaired watershed should address the link between system health and water quality, especially in a system with such intimate linkage between the surface water and the UFA. And this future consideration section ought to be expanded into a full AM uncertainty management exercise.</p>	<p>Consider adding water quality as issue of ongoing concern for the priority springs.</p> <p>This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report.</p>	

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			<p>And as I have advocated time and time again, an explicit AM umbrella should be applied by the District in each setting each MFL, and for re-evaluations. A first step is simply bringing a full discussion of sources of uncertainty in every stage of the process, and identifying specific actions that can be undertaken or implemented to reduce the negative effects of uncertainty on our ability to protect and manage the water resources and the WRVs of the LSFR and IR watersheds.</p> <p>My key concern was also raised by the UF team in their peer review of the initial set of MFLs back in 2013. Those comments were not acted upon by the District then in establishing the initial MFLs for the LSFR and IR in 2013, and it appears that this specific and very pointed peer review recommendation to evaluate event based WRV metrics was rejected outright. I consider this an error. It was an error in 2013, it was an error ignored in 2013, and it is an error that persists in 2020. The same issues are before us again. I note that any real comment on this matter were deleted from the earlier April 2019 draft of this MFL documents. So, there is a concerted effort now over 7 years to discount any method other than the %change. Further, as the field of E flows develops (see document) it is important to keep abreast of the state of the science. It is my opinion that a reliance on %change metrics, and specifically the 15% change method is not the best available approach.</p>		
	Appendix A				

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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
	Appendix A	No	Appendix A Priority Springs Description Document is very well written summary of the priority springs in the LSFR and IR watersheds. Table 1 provides summary characteristics for all 17 springs, 11 in the LSFR and six in the IR. Includes list of references. Includes a very nicely composed and formatted 1-page description for each spring with photo, and text covering: location, physical description of spring system, and utilization. Overall, this is a well written, easy to read document. It that serves its purpose admirably. I do not recommend changes`	No further action required.	
	Appendix B				
	Appendix B	No	Appendix B1 Water Use Hindcasting (Author: SRWMD, 2019) Fourteen pages. Into, Overview of Process, Timeseries of groundwater use data, sources, break out of use types, summary of state by state tailored approach (FL, GA, SC). List of references.  Since this GW use assessment was done in support of the NFSEG model, which was also peer reviewed, then I assume this work has already been deemed acceptable for use in the NFSEG model.	No further action required.	
			Appendix B2 Injection Well Hindcasting (Author: SRWMD, 2019) It appears that this is the same activity that District did in support of NFSEG model. There is a lot of hindcasting done here, and the text reads like it is part of a larger	Please answer questions and make correction noted.	

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			document. So, I expect that it is part of what was done for development and validation-calibration of NFSEG.  Apparent error—page 3 first paragraph—ratio is off by order of magnitude. It should be 0.0795		
	Appendix C				
	Appendix C	No	Appendix C Reference Timeframe Flow Methodology Four pages of text. This is a very concise description of RT flows/heads. Generating the time series is largely done using NFSEG. It all sounds like a reasonable approach to get to the RT flows and heads.	No further action required.	
	Appendix D				
	Appendix D	No	Appendix D-Attachment 1 Transient Model Calibration Results Graphics Fifty-one+ pages. Fifty-one graph figures see the content list on pages 2 and 3. Figures are grouped by river/spring gage/logger location. Twenty-one different sites in the LSFR 7IR watersheds are covered. Fourteen locations on the LSFR from Worthington Springs down to Hildreth. Seven locations on the IR, five of these at priority springs. Most figures address stage, but seven figures cover flows: on the five on the LSFR: Worthington Springs, O'lono SP, US441, Ft. White, Hildreth, and two on the IR: Blue Hole Spring, Dampier's Landing, and Hwy 27. The sets by location have 2-3 supporting figures., One is a scatter plot and the second a time series of daily simulated	No further action required	

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			and observed flows at the given location. Makes for set of three plots the scatter plot of simulated versus observed stage, time series of simulated and observed stages at that gage, and residuals plot for stage difference at that site location. The sequence of three figures do give a good visual picture of the transient model calibration results. Each set tells us quickly how well the simulated match the observed. Moving beyond this section/document, this information forms the basis for doing the species and habitat analysis for SEFA. So, a basic question is, did HSW do the job robustly enough so that we are confident in the using this modeling as the basis for SEFA?		
	Appendix E				
	Appendix E	No	Appendix E WRV Duration Curves Seventeen pages of plots, Figures 1 through 33. Each is flow duration curve with threshold flows for a particular WRV metric.	No further action required.	
	Appendix F				
	Appendix F	No	Appendix F SEFA Rating Curves and Area Weighted Suitability Evaluation Results Twenty-five pages of plots and tables.  Overall this section is simple presentation of results with no supporting text. Tables and figures are straight forward, but	No further action required.	

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			I cannot independently verify that results are correct. So, I accept them with that caveat.		

**TABLE 2. SUMMARY REPLIES TO SRWMD’S PEER REVIEW ASSESSMENT REQUIREMENTS**

Task	Subtask	Sub-subtask	Reviewer’s Specific Comments
1. Determine whether the methods used for establishing the MFLs report are scientifically reasonable	A. Supporting Data and Information: review the relevant data and information that supports the conclusion in the report to determine:	1. data and information used was properly collected.	Yes, I found that the data and information used and relied upon was properly collected. I do not however, support conclusions reached for MFLs for LSFR, IR and priority springs
		2. reasonable quality assurance assessments were performed on the data and information.	Yes, within limits of my ability to independently verify I found this to be true for how data were collected and screened.
	B. Technical assumptions: review the technical assumptions inherent to the analysis used in the report to determine whether:	1. If the assumptions are clearly stated, reasonable and consistent with the best available information	<p>Assumptions are scattered throughout major sections of the document. Assumptions are also present in the six Appendices. I comment on the key assumptions in each section I my detailed comments above. I am in general agreement with assumptions made except for two critically important areas.</p> <p>First, I have a significant objection to the choice of WRV indicators and metrics. I recommend strongly that this be re-evaluated. I make several very specific recommendations.</p> <p>Next, uncertainty must be dealt with explicitly, this is particularly relevant to use of the best available information, tools, analytical methods, conceptual models, simulation models, etc.</p>
		2. Assumptions were eliminated to the extent possible, based on the available information.	For the most part the choices the authors made to data collection, use, analysis and interpretation were streamlined over long time. This effort is a re-evaluation of the initial MFLs developed and adopted in 2015. In this evolution some assumptions were modified and/or eliminated as warranted. I generally agree with how this was handled.

**Report**

Task	Subtask	Sub-subtask	Reviewer's Specific Comments
	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.	<p>Generally, yes, but not in the case of selection, application and interpretation of the evaluation and scoring of WRVs.</p> <p>These problems can largely be eliminated with a more thorough screening of best metrics to protect a particular WRV of interest.</p> <p>It is very strongly recommended that sections 4, 5, 6, and 7 of report be redone following the recommendations provided.</p>
		2. The procedures and analyses incorporate all necessary factors.	<p>Generally, yes, but not in the case of selection, application and interpretation of the evaluation and scoring of WRVs</p> <p>These problems can largely be eliminated with a more thorough screening of best metrics to protect a particular WRV of interest.</p> <p>It is very strongly recommended that sections 4, 5, 6, and 7 of report be redone following the recommendations provided.</p>
		3. The procedures and analyses were correctly applied.	<p>Generally, yes, but not in the case of selection, application and interpretation of the evaluation and scoring of WRVs</p> <p>These problems can largely be eliminated with a more thorough screening of best metrics to protect a particular WRV of interest.</p> <p>It is very strongly recommended that sections 4, 5, 6, and 7 of report be redone following the recommendations provided.</p>
		4. Limitations and imprecisions in the information were reasonably handled.	<p>Generally, yes, but not in the case of selection, application and interpretation of the evaluation and scoring of WRVs</p> <p>These problems can largely be eliminated with a more thorough screening of best metrics to protect a particular WRV of interest.</p> <p>It is very strongly recommended that sections 4, 5, 6, and 7 of report be redone following the recommendations provided.</p>
		5. The procedures and analyses are repeatable.	<p>Generally, yes, but not in the case of selection, application and interpretation of the evaluation and scoring of WRVs</p>

**Report**

Task	Subtask	Sub-subtask	Reviewer's Specific Comments
		6. Conclusions based on the procedures and analyses are supported by the data.	<p>Generally, yes, but not in the case of selection, application and interpretation of the evaluation and scoring of WRVs</p> <p>These problems can largely be eliminated with a more thorough screening of best metrics to protect a particular WRV of interest.</p> <p>It is very strongly recommended that sections 4, 5, 6, and 7 of report be redone following the recommendations provided.</p>
2. If a proposed method used in the report is not scientifically reasonable, then please provide:	A. List and describe scientific deficiencies and, if possible, evaluate the error associated with the deficiencies.		<p>A major deficiency in the approach taken to set and re-evaluate MFLs for the LSFR and IR system. Specifically, the general approach taken to defining indicators and metrics for the WRVs is problematic. It should be re-done. Specific actions for addressing my concern are provided.</p> <p>Part of the method/approach should include comprehensive uncertainty management. This document does not. It lacks a comprehensive analysis of sources of uncertainty, how those affect the goal, and how to move forward with uncertainty reduction.</p>
	B. Determine if the identified deficiencies can be remedied. And provide suggested remedies		<p>Yes, and I make very specific recommendations for this.</p>
	C. If the identified deficiencies can be remedied, then describe the necessary remedies and an estimate of the time and effort required to develop and implement each remedy.		<p>First, redo the screening of list of relevant WRVs for to identify those that can be recast as MDR events.</p> <p>Next, follow procedures of SJRWMD method for statistical sorting and analysis.</p> <p>Compare the MFL metric with the unimpacted flow regime (RTF)</p> <p>Determine compliance, that is the MFL being met under current conditions.</p>

**Report**

<b>Task</b>	<b>Subtask</b>	<b>Sub-subtask</b>	<b>Reviewer's Specific Comments</b>
	D. If the identified deficiencies cannot be remedied, then if possible, identify one of more alternative methods that are scientifically reasonable, based on published literature to the extent feasible.		Deficiencies can be adjudicated by following my recommendations.

