

MINIMUM FLOWS STATUS ASSESSMENT FOR THE LOWER SANTA FE AND ICHETUCKNEE RIVERS AND PRIORITY SPRINGS

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Office of Minimum Flows and Minimum Water Levels



SUWANNEE RIVER WATER MANAGEMENT DISTRICT

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Acronyms

cfs	cubic feet per second
FDEP	Florida Department of Environmental Protection
F.S.	Florida Statutes
Hwy	Highway
LSFI	Lower Santa Fe and Ichetucknee Rivers
MFL	Minimum Flows and Minimum Water Levels
NFSEG	North Florida Southeast Georgia Groundwater Model
OFS	Outstanding Florida Spring
RTF	Reference Timeframe Flow
SJRWMD	St Johns River Water Management District
SRWMD	Suwannee River Water Management District
USGS	United States Geological Survey
WRV	Water Resource Value

Background

This document presents a comparison of the current and 20-year projected conditions of three river compliance gages and associated springs relative to a revised minimum flow and minimum water level (MFL) for the Lower Santa Fe and Ichetucknee Rivers and priority springs (LSFI) (HSW, 2021). “Current”, as used here, refers to the end of the hydrologic record utilized to develop the MFL, in this case, Water Year 2015.

Florida Statutes (F.S.), section 373.0421, implicitly directs the analysis of the existing and projected water body flow when an MFL is first developed or when it is revised:

If, at the time a minimum flow or minimum water level is initially established for a water body pursuant to s. 373.042 or is revised, the existing flow or water level in the water body is below, or is projected to fall within 20 years below, the applicable minimum flow or minimum water level, the department or governing board, as part of the regional water supply plan described in s. 373.709, shall concurrently adopt or modify and implement a recovery or prevention strategy.

Additionally, subsection 373.042(1)(a), F.S., states that “the minimum flow for a given watercourse is the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area”.

Therefore, this LSFI water body status assessment represents an evaluation of the current and projected water body condition relative to the revised MFL from any aggregate change due to withdrawals but is not an evaluation of permit compliance.

Revised MFLs

The supporting information and analysis for the MFL revision is documented in “*Minimum Flows and Minimum Water Levels Re-evaluation for the Lower Santa Fe and Ichetucknee Rivers and Priority Springs*” (HSW, 2021). The LSFI MFL has been independently peer reviewed (Dunn, 2020).

Within the LSFI study area (Figure 1), MFLs are being implemented for three river compliance gages: the Santa Fe River near Fort White (02322500) and the Santa Fe River at US Hwy 441 near High Springs (02321975), both on the Lower Santa Fe River, and the Ichetucknee River at Hwy 27 near Hildreth (02322700) on the Ichetucknee River. These three gages, monitored in cooperation with the United States Geological Survey (USGS), provide the longest and most complete observed flow records for these rivers, subdivide the system into appropriate fluvial geomorphological reaches (AMEC, 2012) and serve as the reference gages for LSFI MFLs. Throughout this technical memorandum, these gages and their respective river reaches will be referred to as Fort White, US441, and Hwy 27, respectively.

For establishing MFLs, the Fort White, US441, and Hwy 27 gages were specified as compliance gages in the LSFI MFL. The MFL proposed for a gage is based on the most conservative hydrologic shift developed from the water resource values (WRVs) evaluated and is applied at the median flow (Table 1). The relative flow reduction, expressed as a percentage, is the difference between the median reference timeframe flow (RTF¹) and the median MFL flow, divided by the median RTF.

¹ A RTF is defined as an estimate of the historic flow that would have been observed in absence of any groundwater withdrawals. In other words, the RTF is a time-series from which impacts of groundwater withdrawals have been removed.

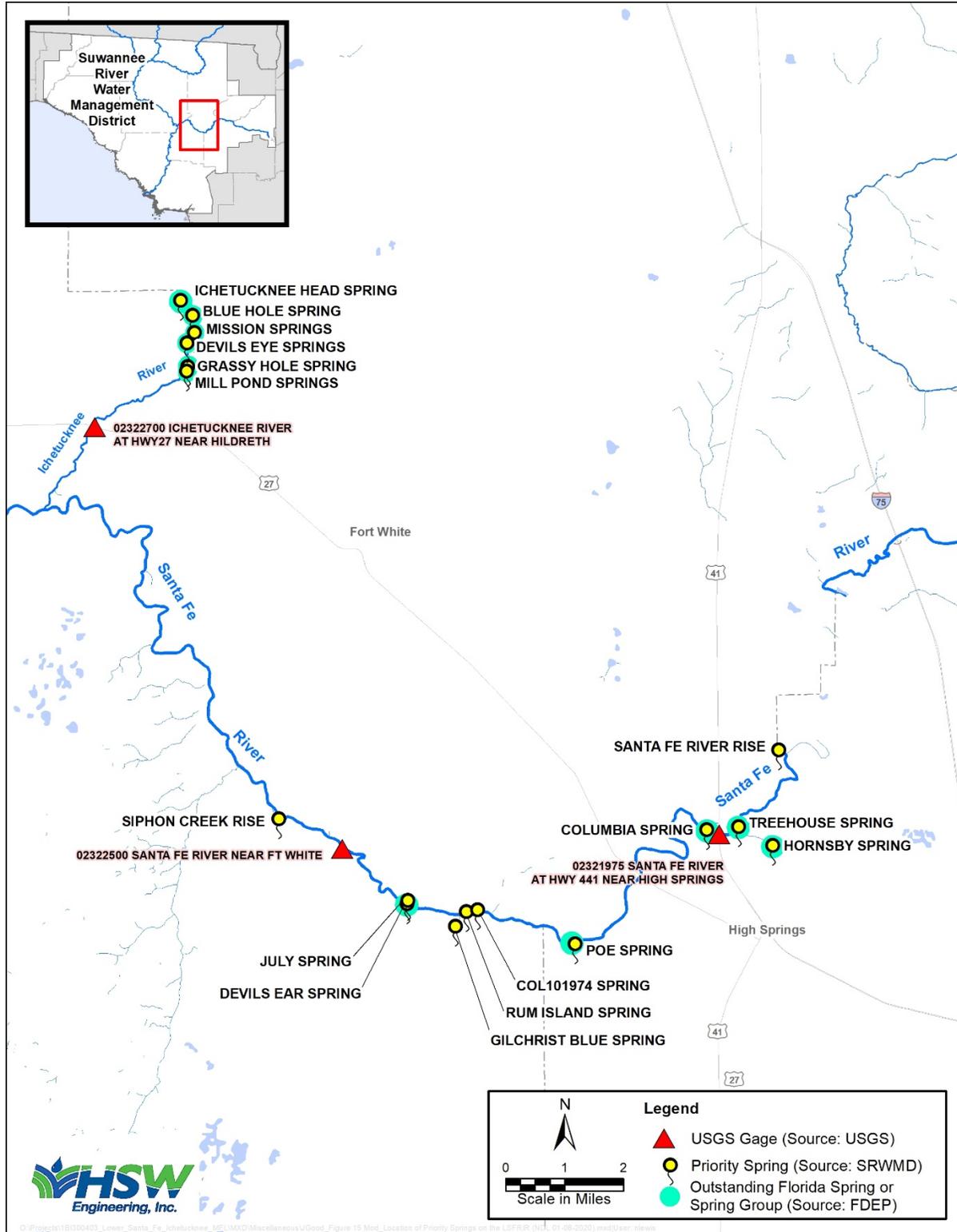


Figure 1. River Gage and Spring Location Map (from HSW, 2021)

Table 1. RTF and MFL Flow Values for the Lower Santa Fe River and Ichetucknee River.

Parameter	Lower Santa Fe Fort White	Lower Santa Fe US441	Ichetucknee Hwy 27
RTF Median Flow (cfs ²)	1,270	552	356
MFL (cfs)	1,167	502	346
Difference (cfs)	103	50	10
Relative Flow Reduction (%)	8.1	9.1	2.8

There are numerous springs which contribute flow to the Lower Santa Fe and Ichetucknee Rivers, therefore reductions in groundwater flow from these springs result in corresponding reductions in river flows. Due to limited flow and biological data from individual springs, the MFLs for priority springs are based on the long-term median flow for their respective river gages. Thus, the recommended LSFI priority spring minimum flows correspond to the river flow reductions, which were established using the most limiting WRV assessed for each river or river segment.

The seventeen priority springs associated with the revised LSFI MFL are evaluated at their corresponding river gages (see Table 2). Spring flow reductions due to withdrawals are collectively limited to 9.1 percent for the four Priority Springs in the US441 reach, 8.1 percent for seven other Priority Springs on the Lower Santa Fe River downstream of US441, and 2.8 percent for six Priority Springs on the Ichetucknee River.

Table 2. List of Priority Spring MFLs by River Gage Site.

Lower Santa Fe Fort White	Lower Santa Fe US441	Ichetucknee Hwy 27
Poe Spring (OFS ³)	Santa Fe River Rise	Ichetucknee Head Spring (OFS ⁴)
COL101974	Hornsby Spring (OFS)	Blue Hole Spring (OFS ⁴)
Rum Island Spring	Treehouse Spring (OFS)	Devil's Eye Spring (OFS ⁴)
Gilchrist Blue Spring	Columbia Spring (OFS)	Grassy Hole Spring (OFS ⁴)
Devil's Ear Spring (OFS)		Mill Pond Springs (OFS ⁴)
July Spring		Mission Springs (OFS ⁴)
Siphon Creek Rise		

Status Assessment

The methodology for assessment of withdrawal impacts in the District is based on the water resource use, whether the source of withdrawn water is surface water or groundwater. Due to the

² Cubic feet per second (rate of flow).

³ Outstanding Florida Spring (OFS), as designated in the 2016 Florida Springs and Aquifer Protection Act, Florida Statute 373.802.

⁴ These springs belong to the Ichetucknee Springs Group, which combined are designated as an OFS.

limited use of surface water in the Santa Fe watershed, only ground water use is evaluated to assess the effect of water use on the MFLs.

The estimated change to stream and spring flows due to groundwater withdrawals is determined through the application of a calibrated groundwater model using appropriately specified withdrawal stresses. The model used in this analysis is the North Florida Southeast Georgia Groundwater Model, (NFSEG 1.1) (Durden et.al., 2019). The current and future conditions of the LSFI compared to the allowable reduction in groundwater flow was assessed through groundwater modeling via “pumps off” and “pumps on” scenarios. District staff completed three modeling runs, or scenarios, with the NFSEG v1.1-1.

The “current” condition was evaluated using a dataset based on best available information and represents a 2015 average water use for the District and a 2011-2015 average water use for the SJRWMD portions of the model domain. A simple “pumps off” condition was simulated but with no other changes to the calibrated model. A 2035 scenario was run based on best available model domain-wide growth projections. Finally, a 20-year projected condition (2040) was estimated by using a growth factor from 2030 to 2035 projected conditions for all water use categories except agriculture. Agricultural water use for 2040 was held to 2035 levels based on currently best available data which indicate lower projected demands through 2045.

The allowable reduction in flow at each LSFI compliance gage, which incorporates the groundwater flow from their respective associated springs, was compared to the change from “pumps off” to “pumps on” in steady-state groundwater model scenarios for the current condition, 2035 scenario, and the 2040 projected condition to arrive at the water body status for the LSFI MFL river gages and associated priority springs.

Conclusions

Comparison of water available under MFL conditions and water use amounts were made for current, 2035 and 2040. The results are shown in Table 3 for the LSFI MFL compliance gage sites.

- For current conditions, the Lower Santa Fe River compliance gages meet their MFL requirement, while the Ichetucknee compliance gage does not.
- For 2035, only the Fort White compliance gage would meet MFL conditions.
- For 2040, both Lower Santa Fe River compliance gages will not meet their MFL requirement.
- Based on 2015 and 2040 assessment years, the Lower Santa Fe River gages are in Prevention (not expected to meet future MFL requirements) and the Ichetucknee Hwy 27 gage is in Recovery (not currently meeting MFL requirements). The priority springs are assumed, absent other information, to be in the same status category as the river gage site with which they are associated (Table 2).

As noted above, Section 373.0421, F.S. directs the assessment of a water body when an MFL is first developed or when it is revised. If the existing flow or water level in the water body is below, or projected to fall below the MFL within 20 years, the department or governing board is directed to “concurrently adopt or modify and implement a recovery or prevention strategy”. Based on the status defined in Table 3 a Prevention and Recovery Strategy (revised) should be developed for the Lower Santa Fe and Ichetucknee River MFL compliance locations.

Table 3. Status Assessment Flow Value Results by River Gage Site (cfs).

	Lower Santa Fe Fort White	Lower Santa Fe US441	Ichetucknee Hwy 27
Difference between RTF and MFL median flow from Table 1	103	50	10
“Current” Conditions - 2015 Impact	70.7	48.9	15.4
“Current” Conditions - 2015 Net	32.3	1.1	-5.4
“Projected” Conditions - 2035 Impact	102	68.9	23.1
“Projected” Conditions - 2035 Net	1	-18.9	-13.1
“Projected” Conditions - 2040 Impact	106	71.5	24.0
“Projected” Conditions - 2040 Net	-3	-21.5	-14.0
Status	Prevention	Prevention	Recovery

References

- AMEC. 2012. Fluvial Geomorphic Investigation of the Upper Santa Fe River, Lower Santa Fe River, and Ichetucknee River. Live Oak, Florida: Prepared for the Suwannee River Water Management District. 62 pp.
- Dunn, W.J. 2020. Chair's Final Draft: Peer Review Panel Consensus Report for: Technical Report- Minimum Flows and Minimum Levels Re-Evaluation for the Lower Santa Fe and Ichetucknee Rivers and Priority Springs. Prepared for the Suwannee River Water Management District. Submitted September 30, 2020. 117 pp.
- Durden, D., Gordu F., Hearn D., Cera T., Desmarais T., Meridth L., Angel A., Leahy C., Oseguera J. and Grubbs T. 2019. *North Florida Southeast Georgia Groundwater Model (NFSEG v1.1)*. St. Johns River Water Management District Technical Publication SJ2019-01. Palatka, Fla. St. Johns River Water Management District. 513 pp.
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