Minimum Flows Determination and Status Evaluation of Four Outstanding Florida Springs:

Falmouth Spring,

Lafayette Blue Spring,

Peacock Springs, and

Troy Spring

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Suwannee River Water Management District

Water Supply Division

DRAFT

Contents

Background

In 2016 the Florida Legislature enacted Ch. 2016-1, Laws of Fla., which created Section 373.802(4), Florida Statutes and thereby defined the term "Outstanding Florida Springs" (OFS). Fourteen OFS or OFS groups lie within the boundaries of the Suwannee River Water Management District (SRWMD). Minimum flows or minimum water levels (MFLs) have been adopted for ten of the OFSs which lie within the SRWMD. No MFL has been adopted for the remaining four OFSs which lie within the SRWMD (the "Four Remaining OFSs"). The Four Remaining OFSs are all located along the Suwannee River between the Ellaville and Branford USGS river gages (see Figure 1). For MFL purposes this reach of the river is included in the Middle Suwannee River study area. The Four Remaining OFSs are:

a) Falmouth Spring;

b) Lafayette Blue Spring;

c) Peacock Springs; and

d) Troy Spring.

Ch. 2016-1, Laws of Fla., also created Section 373.042(2)(a), Florida Statutes to require that, by July 1, 2017, an MFL must be adopted for all OFSs (which did not already have an adopted MFL) and to authorize the use of emergency rulemaking for such purposes.

This technical memorandum has two objectives. The first objective is to present the recommended MFLs for emergency rule making for the Four Remaining OFSs based upon the best information available. The second objective is to determine the current and 20-year projected condition of the Four Remaining OFSs relative to the recommended MFLs.

Ch. 2016-1, Laws of Fla., also created Section 373.805(1), Florida Statutes which requires that a recovery or prevention strategy must be adopted concurrently with the MFL, if the subject OFS is below or projected within 20 years to fall below the MFL. Development of an effective prevention or recovery strategy involves not just the determination of whether MFLs are violated, but also necessitates the estimation of the volume or rate of water flow to be used as a target for water supply planning and water resource development projects in order to recover or protect the MFL.

The evaluation of the current and projected water body conditions relative to the MFL is referred to as a status assessment, and does not include evaluation of permit compliance. This document presents a comparison of the current and 20-year projected condition of the Four Remaining OFSs relative to the recommended MFLs.

Recommended MFLs

Methods

Significant work has been done to support the establishment of MFLs for springs associated with the Middle Suwannee River. This site-specific information and analysis, including the calculation of draft MFLs, is documented in a draft report entitled "*Minimum Flows and Levels for the Middle Suwannee River and Priority Springs*" (draft MSR report; SRWMD, 2016) (the "Draft MSR"). The Draft MSR is currently undergoing independent peer review with anticipated finalization in late 2017. The MFLs recommended for springs in the Draft MSR are based on analyses of limits to flow reductions to the river that protect multiple water resource values (WRVs; see Rule 62-40.432 Florida Administrative Code (F.A.C.)) across the entire range of natural flow conditions.

Within the Draft MSR study reach, the Ellaville and Branford USGS gages provide the longest and most complete observed daily flow records for the river. Thus, for establishing MFLs, the Ellaville and Branford gages were specified as compliance gages in the Draft MSR. The MFLs for the priority springs, expressed as an allowable percent change, are based on the needed contribution of flow to the river as evaluated at median river conditions for the two gages, with the result that the spring allowable percent flow changes are protective of the regional WRVs.

Selection of Recommended MFL

The Four Remaining OFSs contribute flow to the river, therefore reductions in groundwater flow to these springs results in corresponding reductions in flow in the river. The Draft MSR found that the minimum flow for Falmouth Spring, adjacent to the Ellaville gage, is an allowable 15% reduction of groundwater flow to the spring. For the springs downstream of the Ellaville gage that contribute flow to the Branford gage (Lafayette Blue, Peacock, and Troy), the Draft MSR found that the minimum flow is an allowable 9.9% reduction of groundwater flow to each spring.

Since the Draft MSR is still undergoing peer review, the MFL recommendations to be made in the final MSR, including those for the Four Remaining OFSs, may differ from the MFL recommendations made in the Draft MSR. Early peer review comments have suggested that the allowable reductions in spring flow should not be considered independent of one another, and that while the proposed 15% allowable reduction in flow at Falmouth Spring may be protective of the resources in the immediate vicinity of the Ellaville gage, this flow may not adequately protect resources downstream where the allowable reduction in flow is proposed to be 9.9%.

Based on the site-specific information in the Draft MSR, the recommended MFL for establishment through emergency rulemaking for Lafayette Blue, Peacock, and Troy Springs is a 9.9 % allowable reduction in groundwater flow to the spring. Taking into account the initial comments in the Draft MSR peer review, the recommended MFL for establishment through

emergency rulemaking for Falmouth Spring is also a 9.9 % allowable reduction in groundwater flow to the spring in order to ensure that downstream resources are not significantly harmed.

These MFLs are recommended because, in staff's professional opinion, based on the best information available at this time, this is the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. It should be emphasized that following completion of the peer review and finalization of the Draft MSR, the MFL recommendations for the Four Remaining OFSs, may be higher or lower than the MFL recommendations made in this document.

It should be noted that the calculated allowable percent reductions presented in the Draft MSR for three of the four OFSs are consistent with interim flow constraints used for water supply planning. In its 2010 Water Supply Assessment, the SRWMD used a 10 percent interim flow constraint for priority resources where MFLs had not been developed. This same constraint was applied by the SRWMD and St. Johns River Water Management Districts (SJRWMD) to assess priority waterbodies without MFLs in the joint North Florida Regional Water Supply Plan (NFRWSP, 2017). The Four Remaining OFSs are adjacent to the western boundary of the joint planning area. Absent site-specific information that indicates a different threshold is more appropriate, the 10 percent threshold appears to be a reasonable, protective standard for planning purposes.

Status Evaluation

Methods

The methodology for assessment of withdrawal impacts in the SRWMD is based on the water resource setting of the Suwannee River, including whether the source of withdrawn water is surface water or groundwater. In the SRWMD over 99% of the fresh water currently withdrawn (excluding once-through power generation use) comes from groundwater sources (based on data reported in Marella, 2014). This strongly influences the methodology used to assess the effect of water use on the MFLs, with the primary focus here on groundwater withdrawal effects on springs.

Groundwater uses may occur in varying amounts over time and at various distances from a spring. The result of individual changes to withdrawal rates may take days, months, or longer before the complete effect of the change can be observed. Additionally, the effects of multiple withdrawals are blended in the resulting spring flow change, and the peak effects of transient withdrawals are delayed in time. For these reasons, management of groundwater withdrawals in real-time is impractical at present and is instead addressed here as an analysis of changes in long-term flow conditions due to cumulative groundwater withdrawals.

The method used to estimate the degree to which water withdrawal effects impact stream and spring flow is the application of a groundwater model using appropriately specified withdrawal stresses. The model used in this analysis is the North Florida Southeast Georgia (NFSEG)

Groundwater Model, Version 1.0 (Gordu, et.al., 2016). The current and future conditions of the springs compared to the 9.9 percent allowable reduction in groundwater flow to each spring was assessed through groundwater modeling via "pumps off" and, "pumps on" scenarios. District staff completed three runs with the NFSEG v1.0. First, the calibrated (2009) model was run. Secondly, a simple "pumps off" condition was simulated in which withdrawals of groundwater from wells have been removed, but with no other changes to the calibrated (2009) model. Finally, the 20-year scenario (i.e., for 2035) was run based on domain-wide growth projections developed for the NFRWSP (SRWMD and SJRWMD, 2017). The results of the analyses provide an estimate of flow change due to groundwater withdrawal at the OFS based on estimates of current and 20-year projected groundwater withdrawal.

The 9.9 percent allowable reduction in groundwater flow to each spring was compared to the change from "pumps-off" and "pumps-on" steady-state groundwater model scenarios for the current condition (2009) and the 20-year projected condition (2035) to arrive at the spring status.

Results

The results are shown in Table 1 for the OFS. Groundwater modeling simulations using the NFSEG v1.0 were run to assess the flow reduction estimates. Based on these results, the Four Remaining OFSs are meeting their MFLs based on current and 20-year projected demand.

Table 1. Spring status in relation to the recommended minimum flow constraints.

Water Body Name	Allowable Decrease in Flow per MFL	Modeled Flow Decrease		Recovery/Prevention Strategy Needed?
		2009	2035	
Falmouth[1]	9.9%	3.5%	5.0%	No
Lafayette Blue	9.9%	2.7%	4.0%	No
Peacock	9.9%	2.1%	3.1%	No
Troy	9.9%	3.7%	5.8%	No

1. Falmouth Spring functions as a karst window with flow returning to the upper Floridan aquifer before reaching the Suwannee River. Discharges from Lime, Lime Run and Suwanacoochee Springs have been linked to Falmouth Spring via dye-tracing. Therefore, changes in flow to Falmouth Spring were determined by evaluating changes in the total flows of Lime, Lime Run, and Suwanacoochee Springs. For example, a one (1%) percent reduction in the sum total of the flows from Lime, Lime Run and Suwanacoochee Springs would be deemed a one (1%) percent reduction in flow for Falmouth Spring.

Figures

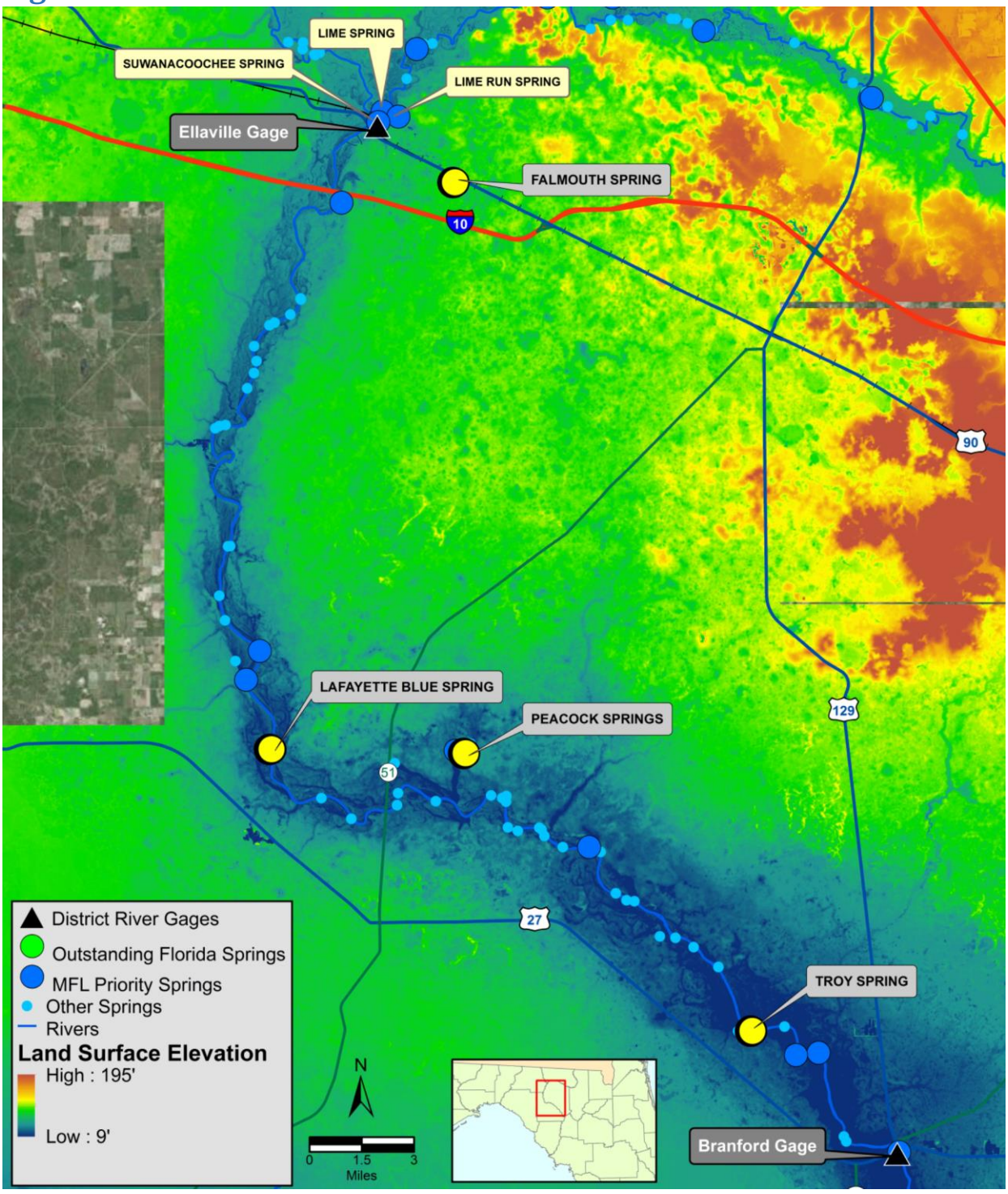

Figure 1. Location of Four Outstanding Florida Springs.

References

Gordu, F., Durden, D. and Grubbs, T. Development and Calibration of the North Florida Southeast Georgia Groundwater Model. SJRWMD/SRWMD Draft Document, 2016

Marella, R.L., 2014, Water withdrawals, use, and trends in Florida, 2010: U.S. Geological Survey Scientific Investigations Report 2014-5088, 59 p., http://dx.doi.org/10.3133/sir20145088.

SRWMD. 2011. *2010 Water Supply Assessment.* SRWMD, Live Oak, FL. 94 pp.

SRWMD. 2016. Minimum Flows and Levels for the Middle Suwannee River and Priority Springs. Draft Report, Prepared by AMEC Foster Wheeler Environment & Infrastructure, Inc., Lakeland, FL., XXX pp.

SRWMD and SJRWMD, 2017. North Florida Regional Water Supply Plan (2015-2035) and Appendices. SRWMD, Live Oak, FL. SJRWMD, Palatka, FL. 64 pp. Available from: http://northfloridawater.com/watersupplyplan/document.html