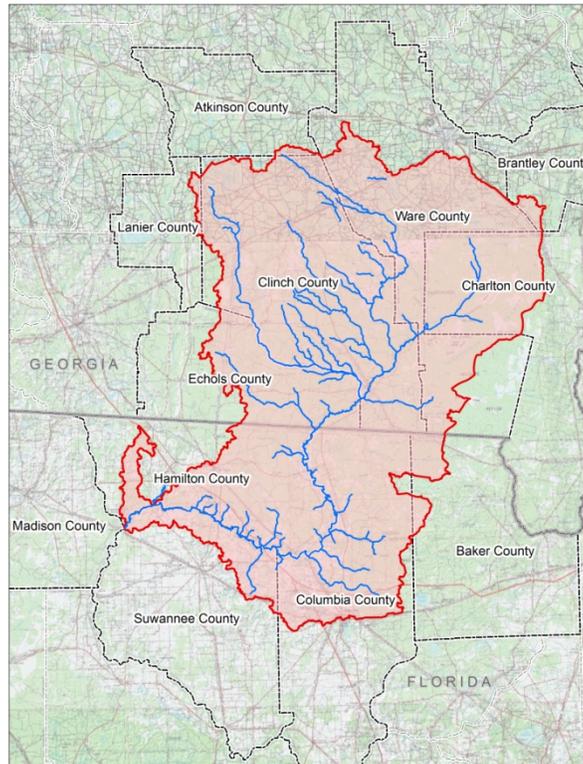


UPPER SUWANNEE WATERSHED REDELINEATION REPORT



OCTOBER 2014



AMEC ENVIRONMENT & INFRASTRUCTURE, INC.
3800 EZELL ROAD, SUITE 100
NASHVILLE, TN 37211



NORTH FLORIDA PROFESSIONAL SERVICES
P.O. BOX 3823
LAKE CITY, FL 32056

INTRODUCTION

STUDY AREA DESCRIPTION

The Upper Suwannee Watershed is located in north central Florida and south central Georgia. It includes portions of Baker, Columbia, Hamilton, Madison and Suwannee counties in Florida as well as seven counties in Georgia. The watershed is largely rural with a generally flat terrain. Figure 1 shows the location of the watershed.

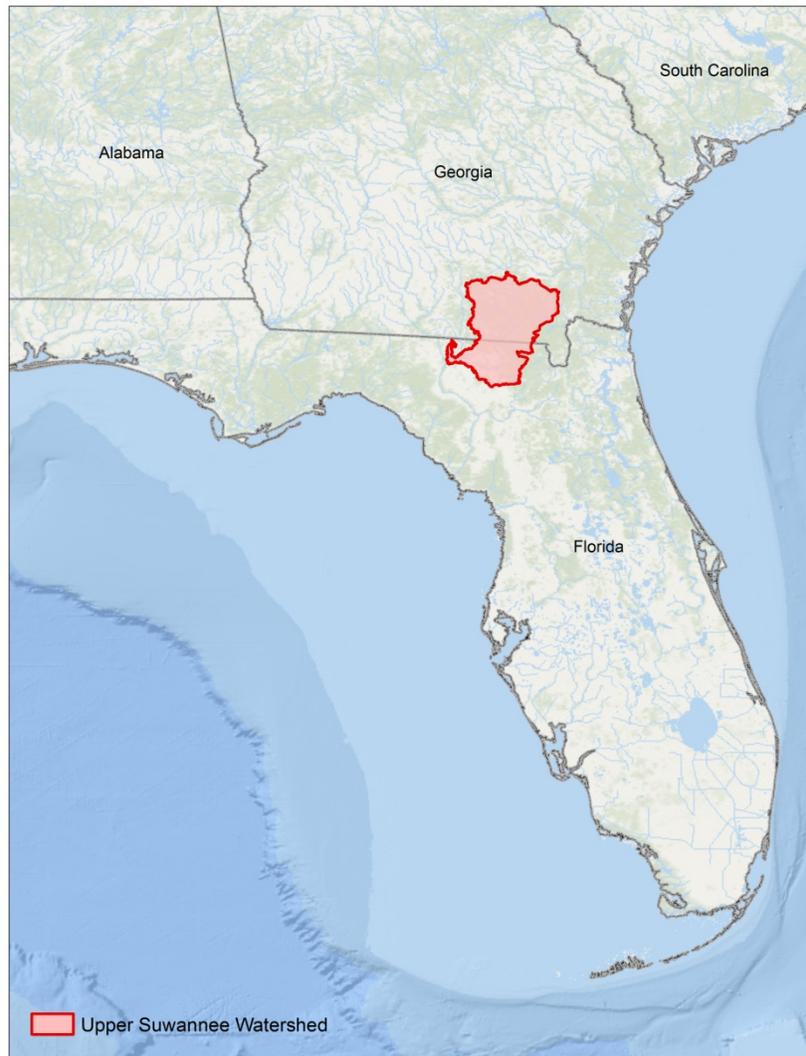


Figure 1: Location of Upper Suwannee Watershed

PROJECT DESCRIPTION

AMEC Environment & Infrastructure, Inc. (AMEC) was tasked to assist the Suwannee River Water Management District (SRWMD) with the revision of the Digital Flood Insurance Rate Maps (DFIRMs) and Flood Insurance Study (FIS) reports for Columbia, Hamilton and Suwannee Counties and creation of non-regulatory Risk MAP products for portions of the Upper Suwannee Watershed. As part of this task, AMEC performed a redelineation of two sections of the Suwannee River as well as a redelineation of Suwannee River Unnamed Tributary. Table 1 summarizes the studies and Figure 2 shows the location of the studies within the watershed.

Table 1: Redelineation Studies

Stream/Reach Name	Counties Affected	Reach Length (miles)
Suwannee River - Section 1 (Upstream)	Columbia and Hamilton	3.3
Suwannee River - Section 2 (Downstream)	Hamilton and Suwannee	3.6
Suwannee River Unnamed Tributary	Hamilton	1.0

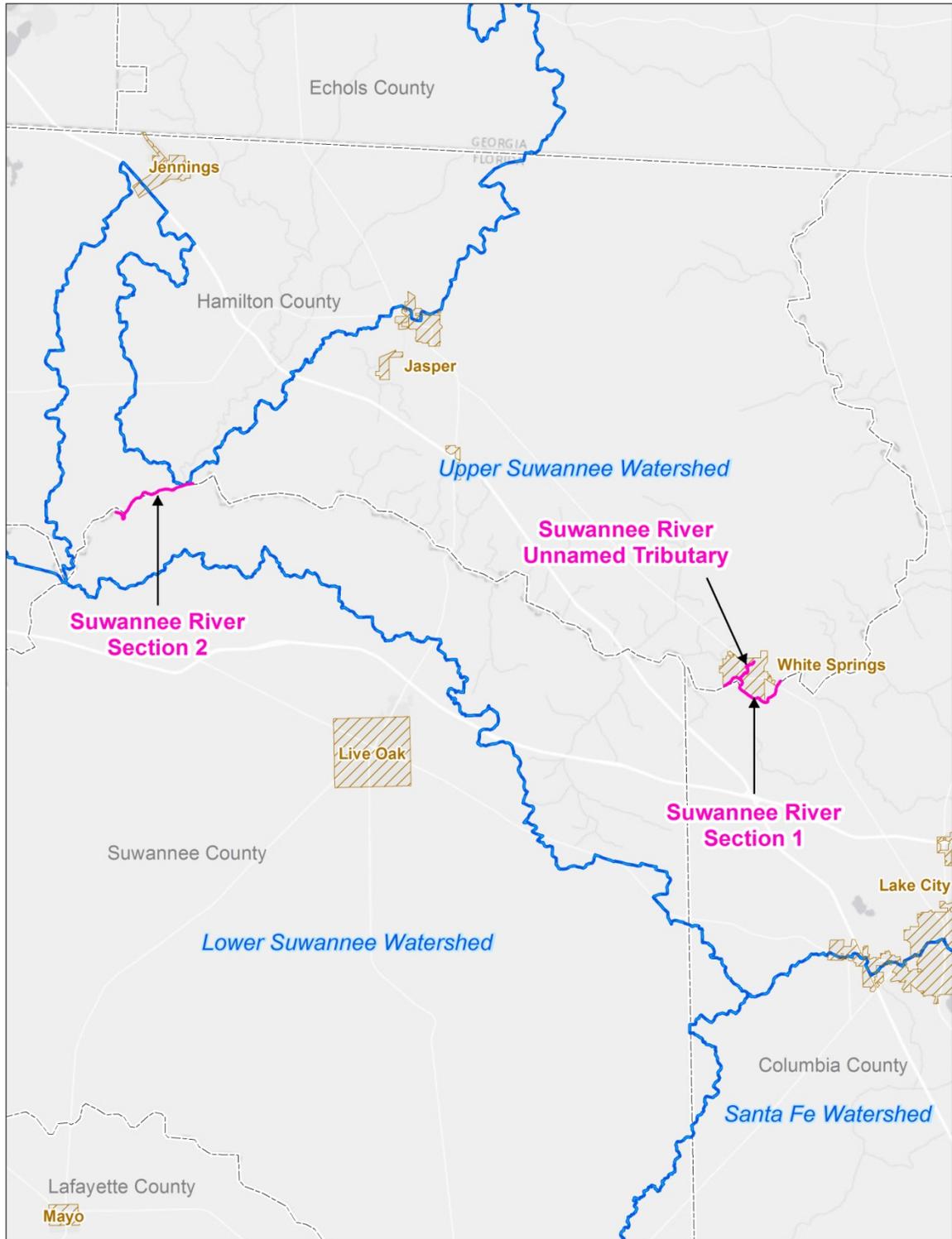


Figure 2: Location of Redelineation Studies

STUDY METHODS

SUWANNEE RIVER OVERVIEW

In a Redelineation Study, the effective flood hazard area is replotted using more up-to-date topography than was used in the previous study. For the Suwannee River, AMEC was unable to determine the exact topography that was used to delineate the effective flood hazard areas. It can only be assumed that the best available topography at the time was used, which in this case would have been either five-foot contour data from the USGS or two-foot contour data from the SRWMD. AMEC replotted the effective water surface elevations using a digital elevation model (DEM) with a cell size of 5 feet, developed from Light Detection and Ranging (LiDAR) data collected in January 2011. This DEM was provided by SRWMD.

AVAILABLE DATA

Originally, the hydraulic study of the Suwannee River was performed using a series of HEC-2, step-backwater models, derived from channel survey and two-foot contour mapping. These models have since been converted to HEC-RAS and combined into an upstream and downstream model. The upstream model (Suwannee.prj) begins near the Hamilton-Columbia County border, just south of Echols County, Georgia, at River Mile 206.35, and extends to River Mile 127.49 near the Madison-Hamilton County border. This model was completed in June 2006. The downstream model (Suwanee.prj *Note only one “n”) shares concurrent cross sections with the upstream model and continues to approximately three miles upstream of the confluence with the Gulf of Mexico. This model was originally completed in August 2005 and was last updated February 2009. Neither model was georeferenced; instead, it was assumed that a correlation existed between select cross-sections in the HEC-RAS model and lettered cross-sections (S_XS) in the available DFIRM databases.

DFIRM databases available for the current effective study dates include:

- Columbia County – 2/4/2009
- Hamilton County – 6/4/2010
- Suwannee County – 4/16/2013

BASELINE CALIBRATION

Ideally, an effective hydraulic model is georeferenced, meaning that each modeled cross-section, denoted by a unique river station in the model, corresponds to a known spatial location along the stream centerline. Georeferenced models can easily be remapped on LiDAR using GIS processes. Given that the effective HEC-RAS model for the Suwannee River was not georeferenced, and no work maps were discovered during a search of the FEMA engineering library, the process for remapping was a little more complex.

Effective cross-sections (S_XS, which were converted from paper format to digital format during Map Modernization), locations of bridge crossings (apparent in the best available orthoimagery), and the effective stream centerline (S_Wtr_Ln, also converted from paper to digital during Map Modernization) were used as a starting point. Each S_XS and bridge location has a known distance from a point downstream, which in this case is the confluence with the Gulf of Mexico. This distance is provided in the profiles and floodway data table (FDT) published in the effective Flood Insurance Study (FIS) report and typically corresponds to the river station of each cross-section found in the effective HEC-RAS model.

SUWANNEE RIVER SECTION 1 (UPSTREAM)

The scope of this section spans from stream station 168.15 to approximately 1,200 ft. upstream of stream station 171.09, covering portions of both Hamilton and Columbia Counties. To ensure consistency across the two counties, the effective FDTs and the S_XS shapefiles were compared with the existing HEC-RAS data. The following sections summarize the discrepancies found, methods for correcting the errors and the resulting revised data for each county.

HAMILTON COUNTY

For Hamilton County, the elevations in the effective S_XS shapefile did not match the elevations in the effective FDT. AMEC updated the stations and water surface elevations in the S_XS shapefile and the FDT to match the HEC-RAS data for all cross sections.

COLUMBIA COUNTY

For Columbia County, the elevations in the effective S_XS shapefile and effective FDT published in the FIS report for Columbia County did not match the elevations that had been confirmed by the HEC-RAS data for the shared cross sections in Hamilton County nor did the datasets correlate. The datum conversion from NGVD29 to NAVD88 for Columbia County is -0.84 feet. Applying the datum conversion to the effective FDT resulted in elevations that were consistent with those in Hamilton County. Based on this comparison, it was evident that the datum conversion had not been applied to the elevations in the effective FDT. AMEC updated the stations and elevations in the FDT to accurately reflect the datum conversion, and updated the water surface elevations in the S_XS shapefile to match the updated FDT.

SUWANNEE RIVER SECTION 2 (DOWNSTREAM)

The scope of this section spans from approximately 0.72 miles downstream of stream station 132.59 to stream station 135.59, covering portions of both Hamilton and Suwannee Counties. To ensure consistency across the two counties, the effective FDTs and S_XS shapefiles were compared with the existing HEC-RAS data. The following sections summarize the discrepancies found, methods for correcting the errors and the resulting revised data for each county.

HAMILTON COUNTY

For Hamilton County, the elevations in the effective S_XS did not match the elevations in the effective FDT. AMEC updated the stations and water surface elevations in the S_XS shapefile as well as the FDT to match the HEC-RAS data.

SUWANNEE COUNTY

For Suwannee County, the elevations for cross section AT in the effective S_XS shapefile and FDT did not match the elevations in the available HEC-RAS data. AMEC reviewed the available HEC-RAS data and determined that the datum conversion from NGVD29 to NAVD88 (-0.72 feet) was not applied correctly for cross section AT in the FDT and the S_XS shapefile. AMEC updated the S_XS shapefile and FDT elevation for cross sections AT (stream station

132.59) to match the available HEC-RAS data. After these corrections were made, the elevations match between the shared cross sections in Suwannee and Hamilton Counties, considering the 0.1 ft. difference when applying the countywide specific datum conversion. All S_XS features and FDT information for all cross sections were updated so that discrepancies between the effective S_XS and FDT outside of the scoped reach were also eliminated.

SUWANNEE RIVER UNNAMED TRIBUTARY

The effective flood hazard areas for Suwannee River Unnamed Tributary were delineated using a 30-meter DEM for Hamilton County. AMEC replotted the effective water surface elevations using a DEM with a cell size of 5 feet, developed from LiDAR data collected in January 2011. This DEM was provided by SRWMD.

AVAILABLE DATA

A georeferenced HEC-RAS model, developed in August 2008, was available for the detailed study area of Suwannee River Unnamed Tributary. The confluence of Suwannee River Unnamed Tributary with the Suwannee River is located approximately 750 feet downstream of State Road 135. The model extends from the confluence with Suwannee River to approximately 1.36 miles upstream.

DFIRM databases available for the current effective study dates include:

- Hamilton County – 6/4/2010

BASELINE CALIBRATION

Although the existing model for Suwannee River Unnamed Tributary was georeferenced, discrepancies were found when comparing the cross section station values in the FDT for Suwannee River Unnamed Tributary published in the effective FIS report for Hamilton County and the S_XS shapefile with the model results. For example, AMEC used the spatial locations of the effective profile baseline and the S_XS shapefile to determine that the distance between the first unlettered cross section (i.e. the limit of the detailed study at the confluence with Suwannee River) and lettered cross section A was 86 feet, which was consistent with the stationing in the effective FDT and effective profile. However, cross-section A in the effective S_XS shapefile was attributed with a station value of 227, which matched the stationing in the model data. After comparing the reach lengths, AMEC determined that the downstream end of the model stream centerline included an additional 139.97 feet although the modeled floodplains didn't start until the first unlettered cross section. In order to minimize the amount of changes made to the effective data, AMEC changed the stations in the S_XS shapefile to match the values in the effective FDT. For the purpose of a redelineation, cross section station values are essentially a unique identifier so adjusting all of the station values by the same factor, in this case subtracting 139.97 feet, had no impact on the results of the redelineation. The stationing of the first unlettered cross section of the detailed study is now 0, which corresponds to the station start reference "confluence with Suwannee River". Results are summarized in Table 2.

Table 2: Station Comparison

Data from Model				Stationing Comparisons		
Reach ID	Lettered XS	Reach Length*	Distance from confluence with Suwannee River*	Effective FWDT	Model XS*	Effective S_XS (Lettered and Not Lettered)
1		140			140	143
2	A	86	86	86	226	227
3	B	155	241	241	381	380
4		63	304		444	444
5	C	440	744	743	884	882
6		230	974		1114	1114
7		69	1043		1183	1183
8	D	208	1251	1251	1391	1389
9		44	1295		1435	1436
10	E	927	2222	2221	2362	2360
11		489	2711		2851	2851
12		146	2857		2997	2999
13	F	74	2930	2930	3070	3073
14		41	2972		3112	3110
15	G	461	3433	3432	3573	3575
16		430	3863		4003	4002
17		119	3982		4122	4124
18	H	80	4062	4061	4202	4203
19		62	4123		4263	4261
20		432	4555		4695	4694
21		109	4664		4804	4805
22	I	70	4734	4733	4874	4873
23		106	4840		4980	4979
24	J	491	5330	5330	5470	5470
25		38	5368		5508	

* Values have been rounded

REDELINEATION RESULTS

Floodplains for the 100 and 500-year recurrence intervals, as well as the regulatory floodway, were generated from the calibrated redelineation data using the LiDAR-derived DEM as the ground surface, by automated GIS methods. The floodplains were refined manually, generally smoothing out the transitions between known cross-sections. The new preliminary products from this redelineation study include the aforementioned floodplains and floodway, newly placed base flood elevation lines, and the calibrated profile baseline.

FLOODPLAIN MAPPING

Substantial differences are seen when comparing portions of the floodplains from the effective S_Fld_Haz_Ar shapefile with the floodplains generated through this redelineation process. These differences can be attributed to

the low-resolution topographic data used to map the effective study, and the high-resolution LiDAR data used for the redelineation. The topographic differences of the floodplain plotting can be seen Figure 3.

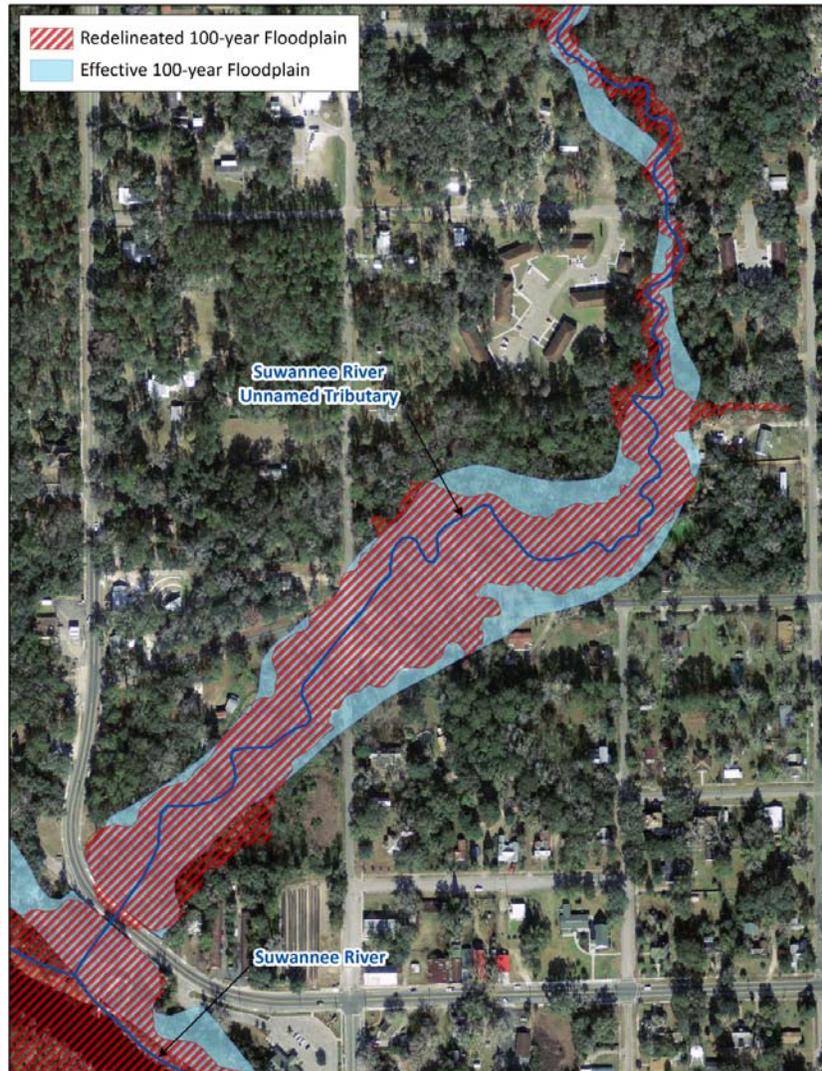


Figure 3: Topographic Data Comparison in Plotting

FLOODWAY MAPPING

As part of the redelineation process, the effective floodway width provided in the FDT at each cross section location is compared to the effective DFIRM database (S_FLD_HAZ_AR). This is accomplished by measuring the floodway width at the cross-sections and comparing the values with the floodway widths from the hydraulic model and the FDTs published in the effective FIS report. Usually these correlate, but discrepancies are tolerable as long as they are within 5% or 5 ft., whichever value is less. As with larger rivers (and wider floodways) such as Suwannee River, greater discrepancies are tolerated. AMEC performed this comparison for each redelineated stream and made adjustments as necessary. These adjustments are summarized in Table 3, Table 4 and Figure 4 below. It should be noted that although an FDT for the Suwannee River Unnamed Tributary was published in the effective FIS report for Hamilton County, there was no floodway in the effective S_Fld_Haz_Ar shapefile nor was it

adequately modeled in the existing HEC-RAS study for the stream, therefore AMEC removed the FDT from the FIS report.

Table 3: Suwannee River Section 1 (Upstream) Floodway Adjustments

Lettered XS		Effective FDT	Effective DFIRM	Floodway Comparison		Floodway Adjustments		
Columbia	Hamilton	Floodway Width*	Floodway Width*	Delta (ft)	Delta (%)	Floodway Width*	Delta (ft)	Notes
C	AB	7,174	7,075	99	1.4%	7,175	1	An additional 50 ft. was added to the floodway in each county
D	AC	4,392	4,356	36	0.8%			
E	AD	2,528	2,501	27	1.1%			
F	AE	3,334	3,356	-22	-0.7%			
G	AF	3,463	3,199			3,459		An additional 130 ft. was added to the floodway in each county

*Total width (not width within each county)

Table 4: Suwannee River Section 2 (Downstream) Floodway Adjustments

Lettered XS		Effective FDT	Effective DFIRM	Floodway Comparison		Floodway Adjustments		
Columbia	Suwannee	Floodway Width*	Floodway Width*	Delta (ft)	Delta (%)	Floodway Width*	Delta (ft)	Notes
B	AR	5,469	5,465	4	0.1%	N/A	N/A	
C	AS	2,585	2,614	-29	-1.1%	2,584	-1	Width of floodway reduced in Hamilton County
D	AT	2,440	2,500	-60	-2.5%	2,441	1	Width of floodway reduced in Suwannee County

*Total width (not width within each county)

Figure 4: Suwannee River Section 2 (Downstream) Floodway Adjustments in Suwannee County

