

The zone of rocks which is described in my report upon the Conecuh River, forming the Gantt Shoal, crosses this river also, and occasions a series of falls and shoals quite similar in character though not so extensive. The first exposure of these rocks is near the mouth of Rattlesnake Branch, and from thence occurring, as we descend the river, at long intervals, until within about 2 miles of its junction with the Conecuh. Here an abrupt fall of 2½ feet takes place, which is followed by an almost continuous shoal to within a few hundred feet of its mouth.

No estimates are made for overcoming these shoals with locks and dams, as the present and future commerce of the river it is thought will be fully subserved by such improvements as will facilitate the descent over them, which may be accomplished by a judicious arrangement of wing-dams and the removal of rock obstructions and snags.

The following estimates will show approximately the cost of removing the obstructions from the mouth of the river to the confluence of Blue Creek, distance by water of 70 miles:

REMOVAL OF SNAGS.	
From mouth of river to Rattlesnake Branch, 18 miles.....	\$2,500
From Rattlesnake Branch to Patsaliga Creek, 28 miles.....	9,000
From Patsaliga Creek to mouth of Blue Creek, 24 miles.....	7,000
	\$18,500
ROCK EXCAVATION AND WING-DAMS.	
5,800 cubic yards loose rock, at 50 cents.....	\$2,900
350 cubic yards solid rock, at \$2.....	700
800 feet wing-dam, at \$1.75.....	1,400
	5,000
Total.....	\$23,500

The foregoing estimate may be reduced very materially by confining the work to removing those obstructions only that form impediments to navigation during moderately high-water.

As the navigation of this stream with steamboats is impracticable, and as this plan of improvement would prolong considerably the rafting season and increase the capacity of production, the most desirable objects, and I believe meet fully in other respects the present needs of the commerce of this river, I would respectfully advise its adoption.

The reduced estimate is as follows:

REMOVAL OF SNAGS.	
From mouth of river to Rattlesnake Branch, 18 miles.....	\$1,500
From Rattlesnake Branch to Patsaliga Creek, 28 miles.....	3,000
From Patsaliga Creek to Blue Creek, 24 miles.....	2,500
	\$7,000
ROCK EXCAVATION, ETC.	
1,200 cubic yards loose rock, at 50 cents.....	\$600
200 cubic yards solid rock, at \$2.....	400
400 feet wing-dam, at \$1.75.....	700
	1,700
Total.....	8,700

Very respectfully, your obedient servant,

HIRAM HAINES,
Assistant Engineer.

Maj. A. N. DAMRELL,
Capt. Corps of Engineers, U. S. A.

J 15.

SURVEY OF ESCAMBIA RIVER, FLORIDA.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., August 7, 1879.

SIR: I have the honor of submitting the following report upon the survey of the Escambia River, Florida, provided for by act of Congress

approved June 18, 1878, and assigned to my charge by letter dated July 8, 1878.

A survey was made of the whole river from the State line between Alabama and Florida to Ferry Pass, near its mouth, a total distance of 100 miles, including White and Delany Rivers (so called, but really channels of the Escambia), both of which were partially examined.

A topographical and hydrographical survey was made of that portion of the delta which includes the two principal outlets.

The river is a continuation of the Conecuh River, of Alabama, the change in name taking place at the State line. It was found to vary from about 150 to 300 feet in width, to have an abundance of water, and to be easily susceptible of improvement.

The obstructions were found to be a bar at its mouth and snags, log-booms, and overhanging timber at various points above.

The improvements suggested are to dredge a channel through the bar 150 feet wide and 5½ feet deep at mean low tide, and to remove the other obstructions mentioned, which, with the construction of a few dikes, wing-dams, and shore protections, it is calculated will give a good navigable channel of a minimum depth of 5 feet throughout its entire length during ordinary low-water.

The estimated cost of the whole is \$25,000. The commerce of the river is confined to lumber, of which about 5,000,000 cubic feet, including hewed and sawed, are annually transported down.

The season for this business is limited by the present condition of the river to that of high-water, generally from about November 1 to May 1, or about 6 months in the year.

In consideration of the value of the commerce to be immediately benefited, the generally good character of the river and the comparatively small amount estimated for the improvement, I would recommend the appropriation of the entire amount.

Should a smaller appropriation be made, at least 10 per cent. should be added to the estimate for each year's delay in the work to cover necessary repairs and additional snagging.

After the completion of the improvement it will probably require a yearly appropriation of about \$3,000 to keep the river clear.

The report and maps prepared by Mr. Haines, who made the survey, are transmitted herewith.

Respectfully submitted.

A. N. DAMRELL,
Captain of Engineers.

Brig. Gen. H. G. WRIGHT,
Chief of Engineers, U. S. A.

REPORT OF MR. HIRAM HAINES, ASSISTANT ENGINEER.

MOBILE, ALA., February 24, 1879.

SIR: I have the honor to submit the following report upon the survey of the Escambia River, made in accordance with your instructions of the 5th of September, 1878.

The survey of this river was begun on the 19th of November and completed by the 28th of the same month to Ferry Pass, situated about 1 mile from its mouth, a distance of about 100 miles, including Delany and White rivers, both of which were partially examined. Finding the character and situation of the bars that obstructed the two principal outlets of the river to be such as to render the removal of one of them a *sine qua non* to the question of making the river navigable for steamboats, I deemed it advisable to make such a survey as might serve to determine the most preferable entrance to adopt and the cost of the work. A base-line of about 1½ miles in length was accord-

ingly run along the west shore of the main river, from which trigonometric stations were established at several points in the delta, and a topographical and hydrographical survey made of that part of the delta which embraced the two principal outlets, the triangulation being extended to points Love and Liveoak, thus connecting the work with that heretofore completed of the Escambia Bay.

The Escambia River is a continuation of the Conecuh River of Alabama, the change of name taking place upon crossing the line dividing that State from Florida. Its width is rarely less than 150 feet and often increases to 300 feet. A channel-depth of from 5 to 12 feet at ordinary low-water may be obtained throughout its entire length by the removal of the snags, the dredging, which forms an item in the estimate, being necessary for the rectification of the channel. The country through which it flows is, with but little exception, low, swampy and subject to overflow for several miles on either side. The following altitudes above mean low tide in Pensacola Bay were obtained by correcting the levels of the Pensacola Railroad with bench-marks established in descending the river:

Extreme high-water $\frac{1}{4}$ mile north of Florida line (freshet of 1864).....	68.91
High-water $\frac{1}{4}$ mile north of Florida line (freshet of 1874).....	63.91
Low-water $\frac{1}{4}$ mile north of Florida line	40.61
Low-water at Bluff Springs.....	25.30
Low-water at Moline.....	4.42
Fall to Bluff Springs (20 $\frac{1}{4}$ miles).....	15.31
Fall from Bluff Springs to Moline (32 miles).....	20.88
Fall from Moline to Pensacola Bay.....	4.42

The commerce of the river is exclusively of timber, and as it is the outlet for the transportation to market of all the timber procured upon the Conecuh and its tributaries, it is the scene of considerable activity during what is known as the "rafting season." The following tabular statement of the timber brought down the Escambia River to Ferry Pass is compiled from abstracts and data courteously supplied me by the inspectors from their official records, and affords an exhibit of the timber commerce of the river for some years past.

HEWED TIMBER.

Inspectors.	1872 and 1873.			1873 and 1874.			1874 and 1875.			1875 and 1876.			1876 and 1877.			1877 and 1878.		
	Number of rafts.	Number of pieces.	Cubic feet.	Number of rafts.	Number of pieces.	Cubic feet.	Number of rafts.	Number of pieces.	Cubic feet.	Number of rafts.	Number of pieces.	Cubic feet.	Number of rafts.	Number of pieces.	Cubic feet.	Number of rafts.	Number of pieces.	Cubic feet.
E. Whitmire.....	1,143	26,576	2,926,080	1,411	45,152	3,312,160	324	10,368	829,440	720	23,040	1,768,320	586	18,752	1,439,216	211	6,752	518,216
J. H. Wilson.....	993	31,776	2,438,808	1,306	41,792	3,207,536	429	13,728	1,053,624	800	25,600	1,994,800	643	20,576	1,579,208	5	16	400,328
B. L. Anderson.....	.....	.....	.....	469	15,008	1,101,864	124	3,968	304,544	186	5,932	456,816	193	6,176	474,008	163	5,216	400,328
Murphy & Murphy.....	.....	.....	.....	.....	.....	.....	265	8,480	650,840	534	10,688	820,340	264	8,448	646,884	314	10,048	773,184
C. M. & F. H. Wilson.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tippen & Roberts.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals.....	2,136	68,352	5,364,888	3,186	101,952	7,621,560	1,142	36,544	2,838,448	2,040	65,280	5,010,276	1,686	53,952	4,140,816	1,170	36,984	2,838,522

SAWED TIMBER.

E. Whitmire.....	125	11,325	839,750	261	23,500	705,000	104	9,300	279,000	848	31,375	941,250	161	14,500	435,000	96	8,800	258,000
A. H. Wilson.....	124	11,160	834,800	255	22,950	688,500	104	9,375	281,250	114	10,275	308,250	130	11,700	350,000	.....	.....	.....
B. L. Anderson.....	.....	.....	.....	7	630	18,900	13	1,170	33,100	8	720	21,600	8	720	21,600	22	2,070	62,100
Murphy & Murphy.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	90	8,100	243,000	25	2,250	67,500	22	2,250	67,500
C. M. & F. H. Wilson.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	55	5,000	130,000
Tippen & Roberts.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	138	13,450	403,650
Totals.....	249	22,485	674,550	523	47,080	1,412,400	443	39,825	1,194,750	560	50,470	1,514,100	324	29,170	874,100	337	31,350	940,650
Totals of hewed and sawed.....	2,385	90,837	6,039,438	3,709	149,032	9,033,960	1,585	76,369	4,033,198	2,600	115,750	6,524,376	2,010	83,122	5,014,916	1,527	68,334	3,779,172

In addition to the above, about 2,500 saw-logs are brought down the river to Ferry Pass annually. The average of 2,878 rafts of hewed timber was 22 pieces to the raft. The average of 92,096 pieces of hewed timber was 76.75 cubic feet to the piece. The average of 129,950 pieces of sawed timber was 30 cubic feet to the piece. About 90 pieces of sawed timber compose a raft.

The rafting season commonly commences about the 1st of November and terminates about the 1st of May, during the remainder of the year there being an insufficient amount of water to float the rafts clear of the obstructions in the bed of the river. These obstructions consist almost entirely of snags and fallen trees, which though somewhat numerous are few comparatively to the obstructions of this character found in the rivers above. The principal work required will be the construction of such works as will serve to confine the water to its proper bed. Its tendency to divide into two or more channels or to overspread the adjacent lands, forming innumerable lakes, sloughs, and swamps, will be perceived in the accompanying maps. It is necessary to check this tendency, as far as possible, and to conserve and restore to the main channel the principal abstractions of this character.

The following estimates will designate more particularly the nature and location of the required work. At the entrance of the river no work is considered necessary except the removal of the bar, which should be performed by dredging. The bottom of the bay contiguous to the outlets of the river is an almost level plateau, the depth of water at mean low tide not exceeding 7 feet as far as Liveoak Point.

It is proposed to reduce the bar to the level of that part of this plateau near the mouth of the main river by dredging a channel through it 150 feet wide at the surface and 135 feet at the bottom, affording a depth at mean low-water of 5½ feet. No lateral current has been observed at the mouth of the river, but there is a bifurcation of the surface water, as soon as it passes the extremity of the marsh, tending to diffuse a portion of the matter held in suspension over the shallow beds which flank the channel on each side. This diffusion it is thought should not be restrained, and as the sides of the channel along these beds appear quite capable of sustaining an almost perpendicular face, no revetment or other means are proposed for this purpose.

The tidal observations, which were made during the day only, show that the oscillations of the tide are controlled almost entirely by the direction and force of the wind; winds from the south increasing it and those from the north tending to drive it back and exclude it from the upper part of the bay.

The mean rise and fall of the tide at the mouth of the river was ascertained to be 2 feet; rise of highest tide observed above mean low-water 3.20; fall of the lowest tide below mean low-water 1 foot.

ESTIMATE OF COST.

Removal of snags:		
From State line to Bluff Springs, 20 miles.....	\$2,550	
From Bluff Springs to Moline, 32 miles	3,125	
From Moline to Ferry Pass, 28 miles.....	500	
		\$6,175
Removal of "boom" at Bluff Springs.....	250	
Removal of "boom" at Morgan's Cut-off	250	
Removal of "boom" at Moline	500	
		1,000
Dams and shore protections:		
2,100 feet brush and shore protection, at \$3.....	6,300	
120 feet dike above Williams's Ferry, at \$8.....	960	
150 feet dike opposite Johnson's Landing, at \$10	1,500	
100 feet dike at Morgan's Cut-off, at \$8	800	
150 feet dike at Delany's River, at \$10.....	1,500	
100 feet wing-dam at White's River, at \$10	1,000	
		12,060
Dredging:		
3,000 cubic yards channel dredging, at 20 cents	600	
17,000 cubic yards bar dredging, at 20 cents.....	3,400	
		4,000
Total		23,235

The construction of a wing-dam at the fork of East River, for the purpose of deflecting its current into the channel of the main river, may properly be made the subject of future consideration.

For the removal of obstructions in Big and Little Escambia Creeks, an additional expenditure of \$3,000 is advisable.

A preliminary map of the principal outlets of the Escambia River and profile of the work required at the entrance, and an index map of the river and bay from Pensacola to the Alabama line, accompany this report.

Very respectfully, your obedient servant,

HIRAM HAINES,
Assistant Engineer.

Maj. A. N. DAMRELL,
Captain Corps of Engineers, U. S. A.

J 16.

EXAMINATION OF SUWANEE RIVER, FLORIDA.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., August 26, 1879.

SIR: I have the honor to submit herewith the following report upon the examination of the Suwanee River, Florida, provided for by act of Congress approved June 18, 1878, and assigned to my charge by letter dated July 8, 1878.

The examination of this river was commenced at the Jacksonville, Pensacola and Mobile Railroad Bridge, which crosses the Suwanee River just below the mouth of the Withlacoochee River, near Ellaville, Fla., and extended down the river through East and West Pass to deeper water in the Gulf; and, although much impeded by high-water, sufficient data was obtained upon which to base an estimate for its improvement.

The chief trade of this river, consisting principally of pine, cypress, and cedar timber, is with Cedar Keys, and is carried on in light-draught vessels, and a 5-foot channel is deemed sufficient for its present wants. This 5-foot channel, as estimated, is to extend from the mouths of the river as far up as Roland's Bluff; from thence to Ellaville a 4-foot channel is estimated for.

The estimate for the above improvement is as follows:

Dredging bar at East Pass.....	\$10,903
Dredging bar at West Pass.....	19,235
Deepening of shoals in river.....	24,520
Removal of snags.....	500
Total	55,158

In this estimate the opening of both of the passes is proposed, to enable vessels entering or leaving the river to use either, according to the direction of the wind and weather outside.

An appropriation of \$55,000 is recommended for this improvement, and could be profitably expended during the fiscal year ending June 30, 1881.

Mr. J. L. Meigs, who was in immediate charge of the examination, and to whose report and map, which are forwarded herewith, I would respectfully refer for details, recommends a further allotment of \$800 for a re-examination of this river at low-water; should, however, an appropriation be made for the improvement, this examination could be made during the progress of the work.

Very respectfully, your obedient servant,

A. N. DAMRELL,
Captain of Engineers.

Brig. Gen. H. G. WRIGHT,
Chief of Engineers, U. S. A.

REPORT OF MR. J. L. MEIGS, ASSISTANT ENGINEER.

MOBILE, ALA., July 28, 1879.

SIR: The following report of the examination of the Suwanee River is respectfully submitted:

The time to be devoted to the work being limited, tracings of the plats of the government land surveys were made at the United States land office at Gainesville, Fla.,

with a view to locate the obstructions of the river by referring them to the land lines and thus to facilitate the work.

A small flat-bottom boat was built at Ellaville for the use of the surveying party, and the examination was begun near that town at the Jacksonville, Pensacola and Mobile Railroad Bridge, which crosses the Suwanee River just below the junction of the Withlacoochee River with the Suwanee. The center line of this bridge intersects the meridian bisecting section 24, township 1 south, range 11 east.

The work was seriously impeded by high water in the river, so that the examination of the upper river between Ellaville and New Troy was almost confined to determining the position of the various shoals and obstructions, and to collecting all attainable information from those who had long resided on the river or had been engaged in its navigation. Careful soundings were also made at the different shoals and much information gained in regard to their extent and forms. It is very desirable, however, that a further examination of this part of the river should be made during the stage of extreme low-water. The shoals are generally beds of soft, unstratified limestone, extending either partly or wholly across the river, in some instances covered with shallow deposits of sand and in others bare. The distance across these shoals, measuring with the current of the river, varies from 100 to 500 feet, and at low-water numerous narrow and tortuous channels, separated by large masses of rock, convey the water from the deep pool above the shoal to the pool below. These channels at extreme low-water vary in depth from 15 inches to 3 feet. An accurate estimate of the cost of removing the large masses of rock from these channels and of forcing the water by low dams to flow through a single channel can only be made after an examination of the river at its low-water stage.

At the time of this examination the elevations of the river surface above the low summer stage, as nearly as they could be ascertained, were as follows: at Ellaville, 16 feet; at Grab Island shoals, 15 feet; at Roland's Bluff, 14 feet; at the mouth of the Santa Fe, 11 feet; at Fayetteville, 8 feet; at Old Town, 5 feet; at Rossville, 3 feet; and at Old Clay Landing, 2 feet.

The information gained in regard to the river and its obstructions is given below in a tabular form, as being thus most readily examined:

Tabular exhibit of measurements and observations.

Section of river.	Length of section.	Width of stream.	Depths at low water.		Height of banks.	Remarks.
			Extremes.	Mean.		
	Miles.	Feet.	Feet.	Feet.	Feet.	
From meridian bisecting section 24, township 1 south, range 11 east, to head of Parker's Shoal.	0.72	289 to 300	0 to 12	7.75	22 to 30	The height of banks is given above low-water as nearly as could be ascertained. The soil of the banks is a sandy loam, covered with a growth of saplings and brushes or saw palmetto.
Thence to foot of Parker's Shoal about 300 feet south of south line of section 23, township 1 south, range 11 east.	0.47	290 to 310	0 to 3	2	22 to 30	The upper and lower portions of this shoal are separated for the space of 2,000 feet by water, varying in depth from 3 to 10 feet at low water. Three or four tortuous low-water channels must be thrown into one, and many large detached rocks must be removed.
Thence to head of Bell's Shoal, which bears south 60° east from the southwest corner of section 8, township 3 south, range 11 east, and is from that corner 1,243 feet.	14.40	290 to 310	3 to 15	9.6	22 to 30	At north line of township 2 south, range 11 east, a rocky ledge extends from the left bank into the stream for a distance of 25 feet. There is said to be an unobstructed channel at low water 100 feet wide.
From head to foot of Bell's Shoals, 150 feet.	0.03	300	0 to 4	3	30	This shoal is composed of sand and loose rock. About a dozen large detached rocks, lying in the upper part of the shoal, must be removed. There are two channels at the low-water stage. If the right were closed and the left cleared of obstructions, 4 feet of water might be had.
Thence to the head of Irvine's Shoals; the latter point bears north 17° 13' east (magnetic) from the southwest corner of section 20, township 3 south, range 11 east, and is distant from that corner 4,097 feet.	1.50	290 to 310	3 to 12	6.0	29	

Tabular exhibit of measurements and observations—Continued.

Section of river.	Length of section.	Width of stream.	Depths at low water.		Height of banks.	Remarks.
			Extremes.	Mean.		
	Miles.	Feet.	Feet.	Feet.	Feet.	
From head to foot of Irvine's Shoals, about 260 feet.	0.05	310	4 to 8 in channel.	6.7	28	At Irvine's Shoal a bed of rock extends from the west bank eastward. This is bare at low-water for more than half the width of the river. If the water were confined to the channel near the east bank, and the obstructions were removed, a depth of more than 4 feet at low water might be obtained.
From foot of Irvine's Shoal to head of Bard's Shoal; the latter point is 1,150 feet (following the river bank) below the point where the east line of section 35, township 4 south, range 11 east, crosses the Suwanee River.	11.28	310 to 380	3 to 12	6.1	20 to 30	Where east line of section 27, township 4 south, range 11 east, crosses the river, a small rock ledge projects from right bank at low water about 35 feet. Water deep near left bank.
From head to foot of Bard's Shoal, about 300 feet.	0.06	382	3 to 8	4.9	30	Bard's Shoal is a narrow ledge of rock extending across the river. The navigated channel, which is next to the east bank, makes so rapid a turn as to render the passage very unsafe. This channel should be widened, all the water at the low stage be confined to it, and many large rocks should be removed.
From foot of Bard's Shoal to head of Peacock's Shoal; the latter begins about .11 of a mile south of the north line of section 33, township 4 south, range 12 east.	4.86	390	4 to 6	5.3	25 to 30	About ½ mile east of east line of section 30, township 4 south, range 12 east, some large rocks lie close in to right bank; about ¼ mile west of east line of section 32, township 4 south, range 12 east, a ledge of rock extends at low-water about 100 feet into the channel from the right bank. The channel near left bank is very deep.
From head to foot of Peacock's Shoal is a distance of 500 feet, as nearly as could be ascertained by soundings taken at high water.	0.09	434	3.5 to 7.5	4	28	This is also called Cypress Stump Shoal. The difficult part of this channel is said to be 100 feet long and 15 feet wide. This should be widened to 60 feet and all the water (at the lowest stage of the river) conducted into it by a suitable dam, which would require to be 300 feet long, beginning at the left bank and terminating about 100 feet from the right bank. Large masses of rock must be removed from the head of the channel and elsewhere.
From foot of Peacock's Shoal to head of Strip Jacket Shoal; the latter point is 4,250 feet above the Old Saunders Ferry, which crosses the river at the southwest corner of section 8, township 5 south, range 13 east.	4.89	350	6 to 12	9.0	28	600 feet below point where east line of section 33, township 4 south, range 12 east crosses river, is a ledge of rock extending at low-water 50 feet from right bank into the channel; it does not obstruct navigation. Grant's Island lies ½ mile east of east line of section 2, township 5 south, range 12 east. There is a navigable channel on each side at low-water. The west channel is about twice as wide as the east. This should be cleared of masses of detached rock.

Tabular exhibit of measurements and observations—Continued.

Section of river.	Length of section.		Width of stream.		Depths at low water.		Height of banks.	Remarks.
	Miles.	Feet.	Extremes.	Mean.	Feet.	Feet.		
From head to foot of Strip Jacket Shoal, a distance of 600 feet as nearly as it could be determined by soundings taken at high water. This shoal is also called Townsend Shoal.	0.11	470	5 to 8	4.4	28			Strip Jacket Shoal is a bed of rock extending across the river. The low-water channel is close to the left bank; this must be made wider. The lower end of the shoal is about 50 feet below the head of a small island, and extends upstream about 600 feet, the shoal water being next to the right bank all the way to the head of the shoal. The whole stream at low-water should be made to flow into the east channel, which should be widened. The extreme low-water depth is said to be 2 feet.
From foot of Strip Jacket Shoal to the head of Double Islands Shoals, otherwise called Fort Macomb Shoal.	0.67	340	4 to 10	8	25			
From head to foot of Double Islands Shoal, 1,100 feet; the obstruction here is regarded as beginning about 250 feet above the head of the upper of the Double Islands and as ending 400 feet below the lower of these islands. This and the next two shoals are called the Ft. Macomb Shoals.	0.21	437	2½ to 8	5	25			The difficulty at Double Islands Shoal can be most easily removed by cutting a channel across the lower of the Double Islands. This cutting should remove the upper part of the island in a direction south 85° east. It would be about 150 feet long by 80 feet wide, and 25 feet deep at the deepest part. This cut made, and the channel deepened to 4 feet at low-water, from a point 250 feet above the upper island to a point 350 feet below the lower one, boats drawing 3 feet might safely pass this shoal. The channel now navigable is so tortuous at low-water as to be almost impassable. It is there but 30 feet wide and 2½ feet deep.
From foot of Double Islands Shoal to the head of the shoal below the Willow Islands, a distance of 800 feet.	0.15	390	3 to 8	7.0	28			
From head to foot of shoal below the Willow Islands, 300 feet.	0.06	390	1½ to 4	3.7	28			The channel at low-water is very close to right bank, and is too narrow. As near as could be ascertained by soundings taken at the high-water stage, the width of the channel at low-water does not exceed 30 feet. It should be widened to 60 feet and deepened to 4 feet.
Thence to head of shoal, beginning 700 feet above Moody's Island.	0.19	420	4 to 8	7.0	28			
From head to foot of the shoal above Moody's Island, 700 feet. This shoal terminates at the head of the island.	0.13	600 at the island	1 to 2	1.5	28			The channel is a little nearer the left than the right bank. The soundings from which the position of this shoal is made known were taken when the water was 16 feet above low-water. The bed of the river is probably rock beneath a layer of sand.
From head of Moody's Island to head of Grab Island Shoal. The latter point is 3,200 feet (measured along the bank) above the point where the south line of section 27, township 5 south, range 13 east, intersects the left bank of the river.	2.56	420	3 to 8	5.6	28			A rock ledge projects about 70 feet from the right bank near the middle of section 21, township 5 south, range 13 east, is partly uncovered at low-water. There is a good channel next to the left bank.

Tabular exhibit of measurements and observations—Continued.

Section of river.	Length of section.		Width of stream.		Depths at low water.		Height of banks.	Remarks.
	Miles.	Feet.	Extremes.	Mean.	Feet.	Feet.		
From the head to the foot of the Grab Island Shoal, 600 feet.	0.11	430	5.5 to 8	7.7	28			The soundings (which were taken at high-water) do not indicate a shoal, properly so called, but a narrow channel very close to the left bank. Its width at low-water probably does not exceed 30 feet. It should be widened to 60 feet. The bottom is rock.
From the foot of Grab Island Shoal to intersection of south line of section 36, township 5 south, range 13 east, with river, near new Troy.	2.69	350	6 to 8	7	25			
Thence to head of Rattlesnake Shoal, 2,800 feet above the intersection of the south line of section 17, township 6 south, range 14 east, with the river at Roland's Bluff.	4.22	370	5 to 13	9.3	28			
From head to foot of Rattlesnake Shoal, 200 feet. The position of this shoal was ascertained, as nearly as possible, by means of soundings made in water 14 feet above low-water mark.	0.04	375	4 to 6	5	25			Old boatmen say the low-water channel is on the west side of the river, and that by clearing the channel 3 feet of water would always be available; others say 5 feet are always attainable. The shoal is a rock ledge, extending nearly across the river.
From foot of Rattlesnake Shoal, past Roland's Bluff, to mouth of Santa Fé River.	10.49	375	7 to 21	13.3	16 to 25			About middle of east line of section 10, township 7 south, range 4 east, a ledge of rock extends from right bank about 65 feet into the river. It is bare at extreme low-water, but there is a good channel next to east bank, with a good depth. This rock is no obstruction. The Santa Fé River at its mouth is 313 feet wide by measurement.
From mouth of Santa Fé River to south line of township 8 south, range 13 east.	14.5	375 to 410	0 to 19	10.6	21			
Thence to Old Town, near middle of section 13, township 10 south, range 13 east.	14.72	410 to 440	5 to 22	12.3	15 to 21			
Thence to New Clay Landing, about ½ mile north of south line of section 13, township 11 south, range 13 east.	10.11	420 to 450	9 to 27	14	9 to 15			
Thence to south line of township 12 south, range 13 east, about 1 mile below Fowler's Bluff.	12.67	450 to 480	10 to 28	16.3	6 to 8			
Thence to the junction of the East and West Passes.	9.09	480 to 580	10 to 30	16.9	0 to 6			
Thence to south line of section 4, township 14 south, range 12 east.	2.19	300 to 450	11 to 30	17.2	0 to 2			
Thence to a point (in the channel usually navigated by steamboats, entering East Pass from Cedar Keys) west of southwest extremity of the largest of three islands, which divide the East Pass, into four channels.	0.75	250 to 450	5.5 to 14	9.7	0 to 1			This point is the mouth of the East Pass. The length of the river from the railroad bridge at Ellaville to the mouth of the East Pass is 124.01 miles.
Thence with steamboat channel across the bar, this channel being marked in its shallower parts by a line of stakes set on the port side as you enter the river.	0.63	.....	3 to 5	3.8	.....			NOTE IN REGARD TO SOUNDINGS.—At all shoals the river was carefully cross-sectioned between the shoals; the soundings were generally taken at intersections of the land lines with the river. Between Roland's Bluff and the mouth the soundings were taken at intervals of five minutes, while the boat was floating with the current.

Tabular statement of measurements and observations—Continued.

Section of river.	Length of section.	Width of stream.	Depth at low water.		Height of banks.	Remarks.
			Extremes.	Mean.		
	Miles.	Feet.	Feet.	Feet.	Feet.	
From junction of East and West Passes to mouth of west branch of West Pass, at head of Cat Island Bay.	2.80	150 to 450	7 to 20	12.1	0 to 4	The length of the river from the railroad bridge at Ellaville to the mouth of West Pass, at the head of Cat Island Bay, is 123.87 miles.
Thence by channel in Cat Island Bay and across sand and shell reef to deep water in Gulf of Mexico.	3.31	.....	2.8 to 9.6	5.1	.....

It will be seen from the tabular exhibit that the obstructions to navigation are confined to the upper river above Roland's Bluff, the lower part thence to the mouth being navigable for boats drawing 5 feet at all seasons of the year. Boats of 2 and 3 feet draught, built after the model of those navigating the tributaries of the Mississippi River, will suffice for the traffic of the upper river, and the wants of the population will be met by rendering this part of the river navigable for such boats. This can be done by removing the large masses of detached rock from the low-water channels and by turning the water of these channels at each shoal into a single one. This single channel should be at least 50 feet wide and 4 feet deep at low-water. The principal natural channel of each shoal will therefore require to be made wider and deeper, and to have its abrupt angles cut off. An approximate estimate of the cost of these improvements is given in the following table, in which the price of excavation covers the cost of widening a channel by removing the soft limestone rock forming its bed and depositing it in low dams located so as to turn the water of two or more narrow channels into one.

Estimate.

Name of shoal.	Excavation.		Price.	
	Cub. yds.	Per yard.		
Parker's	2,500	\$1 00		\$2,500 00
Bill's	900	1 00		900 00
Irvine's	870	1 00		870 00
Bard's	3,500	1 00		3,500 00
Peacock's	1,250	1 00		1,250 00
Strip Jacket	4,440	1 00		4,440 00
Double Islands	4,200	30	\$1,260 00	
Do.	2,700	1 00	2,700 00	
				3,960 00
Shoal below Willow Island	1,400	1 00		1,400 00
Shoal above Moody's Island	3,000	1 00		3,000 00
Grab Island	2,000	1 00		2,000 00
Rattlesnake	700	1 00		700 00
Total				24,520 00

The bar at the mouth of the middle branch of the East Pass and the shell reef at the mouth of the west branch of the West Pass were examined, and the channels crossing them were staked out and proper soundings made at low-water. Estimates of the cost of dredging these channels, so as to obtain a depth of 5 feet over these bars at mean low-water, are subjoined. The materials to be removed are mud and a mixture of sand and shells. Beneath these, and deeper than the proposed dredging will go, lies a bed of unstratified limestone.

ESTIMATES.

Cost of dredging bar at East Pass, 28,320 cubic yards, at 35 cents	\$9,912
Engineering and contingencies	991
Total	10,903

Cost of dredging bar at West Pass, 49,960 cubic yards, at 35 cents \$17,486
Engineering and contingencies 1,749

Total 19,235

Cost of removing snags, which are chiefly saw-logs, grounded at one end. 500

The chief trade of the river is in pine, cypress, and cedar timber, furnished to the merchants and cedar-mills at Cedar Keys. Two millions of feet of lumber were thus supplied during the past year. In addition to these, cotton, sirup, and minor farm products in limited quantity are annually sent to Cedar Keys from points on the Suwanee River. In this trade one small steamer is now engaged. Cedar Keys, therefore, being the focus of trade of the region adjacent to the Suwanee, the most important improvement of the river would be the deepening of the bar at the East Pass and the removal of snags from the river channel, for which an appropriation of \$11,403 will suffice.

After passing the bars at the mouths of the East and West Passes of the Suwanee, vessels sailing for Cedar Keys enter a basin of water trending in a southeast direction, and separated from the Gulf by a reef of shells and sand, which terminates at Derrick Island, about 5 miles northwest of Cedar Keys. This basin affords a depth of from 4 to 5 feet of water between the West Pass of the Suwanee and Derrick Gap. The latter is a shallow channel separating Derrick Island from the group of Goose Islands, lying to the eastward. This gap, which is used by coasting vessels, will require to be dredged for a distance of 1,800 linear feet, in order to obtain a depth of 5 feet at mean low-tide. Stakes were set defining the channel, and the following is an estimate of the cost of deepening it:

ESTIMATE.

Cost of dredging Derrick Gap channel, 8,300 cubic yards, a mixture of sand, shells, and mud, at 35 cents \$2,905
Engineering and contingencies 290

Total 3,195

This improvement would greatly facilitate the towing of log-rafts from the mouths of the Suwanee to Cedar Keys, and should be made at an early day.

An appropriation of \$800 is respectfully recommended for a further examination of the shoals of the Upper Suwanee and of the coastwise channels between the Suwanee mouths and Cedar Keys.

The river was carefully gauged at three points, and its discharges per second found to be as follows:

	Gallons.
At the ferry below the railroad bridge, near Ellaville	111,642
At New Troy	130,939
At Old Town	158,876

The examination of the Suwanee was begun on December 30, 1878, after the completion of the surveying boat, and was ended on February 15, 1879, at Derrick Island.

Acknowledgments are due to Messrs. E. H. McIlvaine and A. T. Smith, of the surveying party, for their faithful labors, and to Messrs. A. Grissenan, C. Newman, J. Parker, and many other citizens for valuable information. Messrs. Drew and Bucki, of Ellaville, also contributed much to forward the work.

Respectfully,

J. L. MEIGS,
Assistant Engineer.

Capt. A. N. DAMRELL,
Corps of Engineers, U. S. A.

J 17.

EXAMINATION OF CALOOSAHATCHEE RIVER, FLORIDA.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., August 27, 1879.

SIR: I have the honor of submitting the following report upon the examination of the Caloosahatchee River, Florida, provided for by act