NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Former flood hazard zone designations have been changed as follows:

Old Zone(s)	New Zone
Al through A30	AE
B	X
C	X

Initial Countywide FIS Effective Date: February 2, 2012

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FLOOD INSURANCE STUDY
PUTNAM COUNTY, FLORIDA AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study revises and supersedes the FIS reports and/or Flood Insurance Rate Maps (FIRMs) in the geographic area of Putnam County, Florida, including the Cities of Crescent City and Palatka; the Towns of Interlachen, Pomona Park, and Welaka; and the Unincorporated Areas of Putnam County (hereinafter referred to collectively as Putnam County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates. This information will also be used by Putnam County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the NFIP are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

For the Cities of Crescent City and Palatka and the Towns of Interlachen and Pomona Park, the hydrology and hydraulic analyses for this study were performed by the U.S. Geological Survey, Water Resources Division, for the Federal Insurance Administration, under Inter-Agency Agreement No. IAA-H-8-76, Project Order No. 18. This work for Crescent City, Palatka, Interlachen and Pomona Park was completed in May, March, May, and August 1978, respectively (References 1, 2, 3, and 4).

For Putnam County Unincorporated Areas, the hydrologic and hydraulic analyses for the original study were prepared by the U.S. Geological Survey (USGS), Water Resources Division, for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. IAA-H-17-75. That work was completed in June 1978. Further hydrology and hydraulics analyses were prepared by Engineering Methods & Applications, Inc. (the study contractor) for FEMA, under Contract No. EMW-91-C-2269. This work was completed in January 1992 (Reference 5).

For this Countywide FIS, the redelineation of previously published base flood elevations and new detailed Hydrology and Hydraulics studies for Devall Branch, Two Mile Creek and Unnamed Tributary was performed by Watershed Alliance IV Joint Venture, for the Federal Emergency Management Agency (FEMA), under Contract No. EMA-2002-CO-0011A. This work was completed in 2010.

1.3 Coordination

The purpose of an initial Consultation Coordination Officer (CCO) meeting is to discuss the scope of the FIS. A final CCO meeting is held to review the results of the study, answer any questions, and receive comments on the study.

A summary of the previous countywide FIS CCO meetings is listed below, providing the dates of the initial and final meetings held for communities within Putnam County.

Community Name	Initial CCO Date	Final CCO Date
Crescent City, City of	February 3, 1976	November 9, 1978
Interlachen, Town of	February 1976	November 8, 1978
Palatka, City of	February 3, 1976	May 25, 1979
Pomona Park, Town of	February 3, 1976	November 8, 1978
Putnam County Unincorporated Areas	October 1, 1975 July 14, 1990	August 29, 1980 May 25, 1993

For this first countywide revision, the initial CCO meeting was held on August 6, 2007, and attended by representatives of FEMA, Putnam County, Town of Welaka, Town of Pomona Park, Town of Interlachen, City of Palatka, and the study contractor.

The results of the study were reviewed at the final CCO meeting held on August 3, 2010 and attended by representatives of FEMA, Putnam County, Town of Welaka, Town of Pomona Park, Town of Interlachen, City of Palatka, and the study contractor. All problems raised at that meeting have been addressed in this study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the geographic area of Putnam County, Florida, including the incorporated communities listed in Section 1.1.

The areas studied by detailed methods were selected with priority given to all known flood hazards and areas of projected development or proposed construction. All or portions of Devall Branch, Two Mile Creek and Unnamed Tributary, were studied by detailed methods. Limits of detailed study are indicated on the Flood Profiles (Exhibit 1), Scope of Study table (Table 1), and on the Flood Insurance Rate Maps (Exhibit 2).

All stream reaches with detailed mapping not restudied for this countywide study were redelineated. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. All stream reaches with existing approximate mapping were remapped to the best available topographic data for this countywide study. The study streams, methods and limits are shown in Table 1, "Scope of Study".

Table 1 – Scope of Study

Stream	Limits of New Detailed Study
Devall Branch	From its confluence with the St Johns River to approximately 1,850 feet upstream of State Road 18
Two Mile Creek	From its confluence with the St Johns River to approximately 300 feet upstream of State Road 20
Unnamed Tributary	From its confluence with Two Mile Creek to approximately 60 feet upstream of Moody Road

Stream	Limits of Redelineation for Previous Detailed Studies
Acosta Creek	From its confluence with the St Johns River to approximately 16,600 feet upstream of the confluence of the St Johns River
Castle Lake	Full extents
Chipco Lake	Full extents
Clearwater Lake	Full extents
Clubhouse Lake	Full extents
Cranes Ponds	Full extents
Crescent Lake	Full extents
Cue Lake	Full extents
Dunns Creek	From its confluence with the St Johns River to its confluence with Crescent Lake
Etonia Creek	From approximately 1,000 feet upstream of Baron Road to Holloway Road
Falling Branch	From its confluence with Etonia Creek to Georges Lake
Georges Lake	Full extents
Grassy Lake	Full extents
Gum Creek	From Town of Interlachen Corporate Limits to gas line crossing
Halfmoon Lake	Full extents
Lagonda Lake	Full extents
Lake Broward	Full extents
Lake Grandin	Full extents
Lake Stella	Full extents

Table 1 – Scope of Study (continued)

Stream	Limits of Redelineation for Previous Detailed Studies
Long Lake	Full extents
Putnam Prairie/Wall Lake	Full extents
Redwater Lake	Full extents
Saratoga Lake	Full extents
Simms Creek	From approximately 12,400 feet upstream of the mouth to Sun Garden Road
Star Lake	Full extents
Sugarbowl Lake	Full extents
The St Johns River	From Marion County Line to Clay County Line
Tributary 1 to Simms Creek	From its confluence with Simms Creek to Hercules Road
Tributary 1-A to Simms Creek	From its confluence with Tributary 1 to Simms Creek to South Hercules Road
Tributary 2 to Simms Creek	From its confluence with Simms Creek to Sun Garden Road

All or portions of the following streams were studied by approximate methods in previous FIS reports: Etonia Creek, Lake Argenta, Lake Omega, Lake Stella Drainage Outlet, Little Orange Creek, Oklawaha River, Orange Creek, Rice Creek, and Simms Creek.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards.

This study also incorporated two Letters of Map Revision into this FIS. LOMR Case No. 06-04-B037P revised an effective Zone A from flooding source Lake Estella. The new revised Zone AE has a BFE of 40.06 NAVD88. LOMR Case No. 99-04-351P was issued to change the zone designation for the ponding area in the vicinity of the old fish hatchery from Zone A to Zone B. The incorporated flooding changed the Zone B to Zone AO.

2.2 Community Description

Putnam County, which encompasses a total area of 827 square miles, is in the northeastern part of the Central Peninsula, Florida. Putnam County is bordered by Clay and Bradford Counties to the north; St. Johns and Flagler Counties to the east; Volusia and Marion Counties to the south; and Alachua County to the west. The City of Palatka is the county seat. Putnam County is served by the Southern Railway and the Seaboard Coast Line Railroad, U.S. Highway 17, and several primary state highways. The 2000 population of Putnam County was reported to be 70,423 (Reference 6).

Topography within the county ranges from gently rolling highlands to flat, wide, swampy stream valleys. Land-surface elevations range from approximately 200 feet to approximately sea level along the St. Johns River.

Precipitation, as analyzed in the City of Palatka from 1922 to 2004, ranges from 29.22 inches to 72.80 inches per year, and averages approximately 52.79 inches, most of which is in the summer. The average summer temperature is approximately 81.8 degrees Fahrenheit (°F), and the average winter daily minimum temperature is approximately 58.9°F, with an annual mean of 70.9°F (Reference 7).

2.3 Principal Flood Problems

The flooding in Putnam County can arise from two distinct sources. First, rainfall runoff associated with slow moving, frontal systems, thunderstorms, and tropical storms can cause overflow of streams and lakes, ponding, and sheetflow. Second, the sporadic passage of tropical storms and hurricanes through the area can result in flooding from storm surge and tides along the St. Johns River.

Within the study area, there was limited availability of gage data. Four USGS gages were used (Reference 8, 9, and 10) and are summarized in the table below.

Location	Gage No.	Years of Data
Etonia Creek at Bardin	02245050	1974-1990
Etonia Creek near Florahome	02245000	1974-1990
Simms Creek near Bardin	02245140	1974-1990
Dunns Creek near Satsuma	02244440	1978-1986

Low-lying areas of Putnam County are subject to periodic flooding caused by overflow of the St. Johns River, Dunns Creek, the Oklawaha River, Orange Creek, Little Orange Creek, Rice Creek, Simms Creek, Etonia Creek, and numerous small streams. The soils in the area are mostly sand, causing lower peaks when storms are preceded by periods of little rain. During the principal rainy season, which is from June to October, saturated soils can cause rapid runoff and higher peak discharges, particularly on the smaller streams during intense storms.

The St. Johns River, which has about a 2-foot tidal range at low-discharges, flows past the eastern side of Palatka and averages about 1 mile in width in this location. Flooding from the St. Johns River generally occurs as the result of rains associated with hurricanes. Shallow flooding caused by ponding of runoff during heavy rains occurs in some areas of the City of Palatka.

The St. Johns River, at the mouth of Rice Creek, reached an elevation of 4.68 feet NAVD on September 9, 1964, when Hurricane Dora crossed into northeast Florida from the Atlantic Ocean. This elevation of the water-surface has a recurrence interval of about once in 50-years on the average.

Floods caused by Crescent Lake, Lake Stella, Lake Broward, and Grassy Lake can occur in unpredictable cycles. It is possible for the cumulative effect of slightly above-normal rainfall for several consecutive years can cause greater floods than those caused by one year of exceedingly high rainfall. However, a combination of high lake levels; high ground-water levels; and exceedingly high rainfall, which are associated either with several consecutive summer thunderstorms or with a hurricane, can produce extreme flooding. Any unusual combination of meteorological and hydrologic conditions can produce a rise in the level of these lakes and can result in inundation of the areas adjacent to their normal shorelines.

Interviews with long established local residents provided information on historic high waterlevels for Crescent Lake, Lake Stella, Lake Chipco, Grassy Lake, and Lake Lagonda. It was reported that a hurricane in 1928 caused Crescent Lake to reach a point that, when surveyed in 1978, was 6.3 feet. Also pointed out was a high-water level on Crescent Lake caused by Hurricane Donna on September 11, 1960. This mark was determined to be 5.7 feet. In September 1964, Hurricane Dora was reported to have caused Lake Stella to reach a maximum level of 39.8 feet. It was reported that the high water in 1948 on Lake Chipco reached a level that, when surveyed in 1978, was found to be 84.5 feet. Also, pointed out were two high-water marks from 1948 on Grassy Lake (also known as Interlachen Lake) those were found to be 89.7 and 88.4 feet. Since this high-water period in 1948, Grassy Lake has been dredged in areas, and these historical water levels are not representative of present conditions. Two high-water marks for Lake Lagonda for 1948 were determined to be 78.9 and 78.1 feet.

In 1964, Hurricane Dora caused shallow flooding by ponding and some stream flooding in low-lying areas. The St. Johns River at Rice Creek reached an elevation of 4.68 feet (Reference 5).

2.4 Flood Protection Measures

No special flood protection structures have been built in the county; however, the Florahome Drainage District has improved some drainage ditches in order to accommodate large flows. Rodman Dam and Lake Oklawaha are located along the southern border of Putnam County. The dam was completed, and flow through spillway began on September 30, 1968. A diversion exists for boat traffic from Lake Oklawaha to the St. Johns River through the Cross-Florida Barge Canal.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40-percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60-percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the county.

Pre-countywide Analyses

For all streams in the 1992 restudy, except Falling Branch, USGS regional regression equations were used to compute discharges for 10-, 2-, 1- and 0.2-percent-annual-chance floods. These equations and their usage are described in a publication entitled, Technique for Estimating Magnitude and Frequency of Floods on Natural-Flow Streams in Florida (Reference 10). The regression model relates peak discharge to drainage area, lake area, and slope. Drainage area and lake area were determined from USGS Quadrangle maps and aerial stereo photographs (Reference 11 and 12). The basin slope was determined from surveyed cross sections and USGS quadrangle maps.

In the original study, a regional relationship of drainage area to mean annual peak discharge and the 10- and 2-percent-annual-chance floods, including adjustments for storage in lakes and swamps, was used to define discharge-frequency data for the detailed study of Dunns and Acosta Creek (Reference 13). The 1- and 0.2-percent-annual-chance floods were derived by extrapolation. Acosta and Dunns Creek were restudied in 1992. The regional estimate of discharges can usually be improved when a gaged site is present on the stream. The improvement is accomplished by adjusting regional discharges by a ratio of the gage log-Pearson discharges to the regional estimate (Reference 14). Four USGS gage sites are available within the stream studied by detailed methods. However, the period of record for these gages corresponds to a period of lower than average rainfall. Consequently, the requirement of stationarity is not fulfilled and log-Pearson estimates of extremes would not be valid. This conclusion was confirmed by analyzing data from a long-term gage on South Fork Black Creek in Clay County just north of the streams studied by detailed methods. Two log-Pearson analyses were performed on the data, one for the entire period of record (1939 to 1992) and the second for the period from 1973 to 1992, corresponding to the data in question. The second analysis produced 1-percent-annual-chance peak discharges approximately half of the first analysis; therefore, the gage data for Putnam County sites were not used to improve the regional estimates of the discharges.

In the original study, gaging stations on the St. Johns River near the mouth of Rice Creek (15 years of record), near Deland, Florida (41 years of record), and at Jacksonville, Florida (24 years of record), were the principal sources of data for defining the stage-frequency relationship for the St. Johns River. Values of the 10-, 2-, 1- and 0.2-percent annual chance stages were obtained from the log-Pearson Type III distribution of annual peak stages (Reference 15). These stage-frequency profiles agree with those profiles published by the USACE (Reference 14).

In the original study, no lake-level records had been collected within the county. Lake-level records for 12 lakes in Alachua, Clay, and Marion Counties, which are adjacent to Putnam County, were used to define maximum lake volume-frequency relationships for each site. Seven of these lake-level records had data for more than 20 years, and the maximum length of record is 35 y ears. Of the 12 records, the shortest is 14 years. The drainage areas for these lakes ranged from 0.19 square mile to 319 square miles, and the surface areas of these lakes ranged from 0.015 square miles to 20.6 square miles. The range of change in lake level was from less than two feet to more than 30 feet. These lakes were also vastly different in outflow characteristics from completely closed (no outflow at any flood frequency) to outflow at all flood frequencies.

Flood-frequency curves in the original study were defined for each of the 12 lake-level records. These curves were developed in terms of lake volume measured by a defined base. Volumes were adjusted for outflow, as applicable, and the base level was defined as the mean lake stage. After all annual data (based on a year beginning on June 1 and ending on May 31) were adjusted; analyses were carried out to determine the best technique for fitting flood-frequency curves to the lake-volume data.

A log-Pearson Type III distribution, using the average skew coefficient as outlined in U.S. Water Resources Council Bulletin 17A, was found to be an acceptable technique for fitting flood-frequency curves to the lake-volume data (Reference 15). Values of the 10-, 2-, 1-, and 0.2-percent annual chance volumes were obtained for each of the 12 lakes from this log-Pearson Type III distribution.

In the original study, a regression analysis of frequency data versus drainage area for the 12 lakes was used to define a regional relationship for each recurrence interval. The analysis showed that drainage basin size explained nearly all of the variation in the lake volumes.

In the original study, regression analysis was also used to define a regional relationship between the mean lake stage and grassline elevation along the lake shores of the 12 lakes. The analysis showed that the elevation of the grassline along the shoreline explained nearly all of the variation in the mean lake stage.

The regional relationships in the original study for mean lake stage and for lake volume at the selected recurrence intervals were used with an elevation-change in volume curve for Lake Broward to determine the water-surface elevations for the 10-, 2-, 1- and 0.2-percent annual chance runoff volumes determined by a detailed HEC-1 analysis of each lake (Reference 16). The HEC-1 models used the SCS curve numbers to estimate rainfall losses. The curve numbers were developed using aerial photographs and the Putnam and Alachua Counties Soil Maps (Reference 13, 17, and 18). Snyder’s unit hydrograph was used to transform excess rainfall to runoff. Unit Hydrograph parameters were calibrated from long term USGS gages located in Clay County immediately to the north of Putnam County. The Modified Puls method was used to simulate flood wave movement through lakes and river reaches.

In the 1992 restudy, the lakes analyses accounted for the fact that many lakes in the county have been at unusually low levels in recent years, levels that are not representative of long-term normal conditions. The low levels have resulted from a rain shortfall and would be quickly reversed after a short period of rain surplus. To simply superimpose the HEC-1 flood volumes on the current levels of these lakes would significantly underestimate the flood hazard (by over ten feet in some instances). For this study, lake base-stage data that revealed a common underlying fluctuation pattern associated with long-term fluctuations in regional rainfall totals. Although four of the lakes identified for detailed study (Grandin, Georges, Redwater, and Star) either show little of this variation or are otherwise affected by streams or controls, it was necessary to account for base-stage variability in the treatment of the other seven lakes. This was done by superimposing the HEC-1 volumes, not on the current stages, but on a range of possible antecedent lake elevations, and by then weighting the results to reflect the likelihood of each particular volume/base-stage combination.

To define discharge-frequency data for Gum Creek, which is ungaged, regional relationship of drainage area to the mean annual peak discharge and the 10-, 2-, 1-, and 0.2-percent-annual chance floods (including adjustments for storage in lakes and swamps) was used (Reference 3).

This Countywide Analysis

New detailed studies were performed for Devall Branch, Two Mile Creek and Unnamed Tributary using USACE HEC-HMS Version 3.3 (Reference 19). The Peak Discharges are shown in Table 2, "Summary of Discharges."

Table 2 – Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
ACOSTA CREEK					
At mouth	5.0	683.0	1,203.0	1,456.0	2,127.0
700 feet upstream of west line of Section 9, T 11S, R 27E	3.5	480.0	857.0	1,041.0	1,547.0
East line of Section 26, T 11S, R 26E	2.3	320.0	579.0	708.0	1,079.0
DEVALL BRANCH					
At Confluence with St. Johns River	2.8	311.2	498.0	608.1	952.0
At railroad crossing	2.1	181.6	302.6	379.6	603.6
Approximately 615 feet upstream of Old Peniel Road	1.6	142.0	236.6	297.1	464.9
Approximately 1,825 feet downstream of State Road 19	1.1	118.6	197.9	248.4	389.4
Approximately 1,075 feet downstream of State Road 19	0.9	99.6	165.5	207.2	324.0
Approximately 365 feet downstream of State Road 19	0.4	40.8	68.5	86.2	135.5
At Davis Lake Road	0.2	20.2	34.4	43.5	69.1
DUNNS CREEK					
At U.S. Highway 17	596.9	8,048.0	13,673.0	16,520.0	24,340.0
East line of Section 9, T 11S, R 27	575.0	7,950.0	13,506.0	16,318.0	24,055.0
ETONIA CREEK					
At Bardin Road	216.8	2,498.0	4,393.0	5,342.0	7,742.0
Just upstream of confluence of Unnamed Tributary near the center of Section 1, T 9S, R 25E	211.9	2,404.0	4,235.0	5,152.0	7,482.0
Just upstream of confluence of Rice Creek	183.1	1,866.0	3,319.0	4,053.0	5,954.0
Just upstream of confluence of Falling Branch	172.4	1,720.0	3,070.0	3,754.0	5,548.0

Table 2 – Summary of Discharges (Continued)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
FALLING BRANCH					
At mouth	9.0	775.0	1,354.0	1,551.0	2,117.0
Just upstream of confluence of tributary in Section 30, T 8S, R 25E	5.1	167.0	253.0	284.0	379.0
GUM CREEK					
Town of Interlachen Corporate Limits	4.6	30.0	46.0	52.0	68.0
At Cross Section C	4.3	24.0	37.0	42.0	55.0
At Cross Section M	3.6	19.0	29.0	33.0	43.0
At Cross Section S	3.1	12.0	18.0	21.0	27.0
SIMMS CREEK					
At the Trail Road on east line of Section 5, T 9S, R 26E	46.1	3,154.0	5,357.0	6,422.0	9,145.0
Upstream of confluence of Tributary 1 to Simms Creek (Section 28, T 8S, R 26E)	25.00	2,076.0	3,562.0	4,281.0	6,138.0
At the Trail Road in NW corner of Section 27, T 8S, R 2	18.50	1,655.0	2,857.0	3,439.0	4,957.0
Just upstream of confluence of Tributary 2 to Simms Creek (Section 22, T 8S, R 26E)	10.7	1,185.0	2,061.0	2,486.0	3,616.0
At the road in Section 9, T 8S, R 26E	8.6	936.0	1,642.0	1,987.0	2,929.0
At the county Boundary (Sun Garden Road	5.9	712.0	1,259.0	1,526.0	2,267.0
TRIBUTARY 1 TO SIMMS CREEK					
At mouth	11.2	1,212.0	2,107.0	2,542.0	3,698.0
At north line of Section 29, T 8S, R 26E	9.3	1,029.0	1,799.0	2,174.0	3,186.0
Just upstream of confluence of tributary on east line of Section 19, T 8S, R 26E	8.7	945.0	1,656.0	2,005.0	2,955.0
Just upstream of confluence of Tributary 1-A to Simms Creek (Section 18, T 8S, R 26E	4.3	557.0	991.0	1,205.0	1,806.0
At the road in NW corner of Section 18, T 8S, R 26E	3.2	410.0	737.0	900.0	1,371.0

Table 2 – Summary of Discharges (Continued)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
TRIBUTARY 1-A TO SIMMS CREEK					
At mouth	2.1	412.0	735.0	891.0	1,316.0
At the Trail Road near east line of Section 13, T 8S, R 25E	1.8	322.0	580.0	706.0	1,063.0
At the Trail Road near NW corner of Section 13, T 8S, R 25E	0.9	136.0	253.0	312.0	499.0
TRIBUTARY 2 TO SIMMS CREEK					
At mouth	7.7	819.0	1,442.0	1,746.0	2,558.0
At the Trail Road on east line of Section 17, T 8S, R 26E	5.9	599.0	1,067.0	1,298.0	1,935.0
At the Trail Road in NW quadrant of Section 8, T 8S, R 26E	4.4	423.0	763.0	933.0	1,415.0
At the Trail Road in Section 6, T 8S, R 26E	3.4	316.0	575.0	705.0	1,082.0
TWO MILE CREEK					
At Confluence with St. Johns River	2.7	206.0	347.9	441.3	699.3
Approximately 410 feet upstream of Confluence with St. Johns River	2.6	219.0	368.1	466.3	737.3
Approximately 325 feet upstream of railroad crossing	2.3	207.3	348.6	438	693.1
Approximately 1,350 feet downstream of railroad crossing	2.1	189.9	320.4	403.9	639.5
Approximately 250 feet upstream of Silver Lake Drive	1.8	163.3	275.7	347.7	549.0
At Roddy Road	1.1	110.6	186.0	234.2	368.7
At Carole Road	0.6	65.2	109.4	137.7	216.8
Approximately 400 feet upstream of State Road 20	0.2	33.4	53.3	65.7	99.9
At 1,200 upstream of State Road 20	0.1	27.4	43.5	53.5	80.6
UNNAMED TRIBUTARY					
At Confluence with Two Mile Creek	0.4	40.0	66.9	84.0	132.5
At Silver Lake Drive	0.1	7.0	12.3	15.7	25.5

The Stillwater elevations for the 10-, 2-, 1-, and 0.2-percent-annual-chance floods have been redelineated from the 1992 study and are summarized in Table 3, "Summary of Stillwater Elevations".

Table 3 – Summary of Stillwater Elevations

	Elevation (feet)			
Flooding Source and Location	10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
CASTLE LAKE	68.1	69.5	69.9	71.2
CLEARWATER LAKE	81.7	82.4	82.7	83.3
CLUBHOUSE LAKE	86.8	87.8	88.1	89.1
CRANES PONDS	38.6	38.7	38.8	38.9
CRESCENT LAKE	4.3	5.8	6.4	7.7
CUE LAKE	90.8	91.7	91.8	92.6
GEORGES LAKE	99.1	99.8	100.1	100.7
GRASSY LAKE	80.5	81.5	81.8	82.5
HALFMOON LAKE	*	*	98.1	98.5
LAKE BROWARD	40.0	41.0	41.4	42.1
LAKE CHIPCO	84.2	87.1	88.1	89.5
LAKE GRANDIN	81.7	82.4	82.7	83.3
LAKE ESTELLA	*	*	40.1	*
LAKE LAGONDA	78.2	79.2	79.4	79.8
LAKE STELLA	38.7	39.6	39.9	40.6
LONG LAKE	90.4	91.5	91.8	93.0
REDWATER LAKE	80.0	81.1	81.5	82.9
SARATOGA LAKE	65.0	66.0	66.1	67.1
STAR LAKE	78.0	78.3	78.4	79.7

Table 3 – Summary of Stillwater Elevations (Continued)

Flooding Source and Location	Elevation (feet) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
ST JOHNS RIVER				
At Northern County Boundary	3.5	4.7	5.2	6.4
At Rice Creek	3.5	4.7	5.2	6.4
At North Palatka City Limits	3.5	4.7	5.2	6.4
At U.S. Highway 17	3.5	4.7	5.3	6.4
At South Palatka Corporate Limits	3.6	4.8	5.3	6.5
At Confluence of Dunns Creek	3.7	4.9	5.4	6.6
At Confluence of Acosta Creek	3.7	5.0	5.5	6.8
At Southern County Boundary	3.9	5.3	5.9	7.1
SUGARBOWL LAKE	38.6	38.7	38.8	38.9
WALL LAKE	*	*	95.6	96.4

*Data not computed

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the Flood Insurance Rate Map (FIRM) represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data table in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS report in conjunction with the data shown on the FIRM.

Pre-countywide Analyses

In the original study, non-tidal water-surface elevations of floods of the selected recurrence intervals were computed through the use of the USGS E-431 step-backwater computer model (Reference 20). The mean daily elevation of the St. Johns River was used as the starting water-surface elevation for Dunns Creek. For Acosta Creek, the slope/area method was used to determine starting water-surface elevations.

In the 1992 restudy, water-surface elevations for floods of the selected recurrence intervals were computed using the USACE HEC-2 step-backwater computer program (Reference 21). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. Starting water-surface elevations were calculated using normal depth or mean tide. Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

In the original study, cross-sectional data for the hydraulic analyses of Dunns and Acosta Creeks were obtained from aerial photographs flown in March 1976 and from field verification and corrections made in March 1978 (Reference 22). The below-water sections were obtained by field measurement.

Water-surface elevations were developed for Gum Creek using the U.S. Geological Survey E-431 step-backwater computer model (Reference 20) Starting water-surface elevations for Gum Creek were calculated using flow-over-weir and dam methods (Reference 23).

For the lakes studied by approximate methods, the elevation of the 1-percent-annual chance flood was developed from normal depth calculation and flood prone area maps (Reference 24).

This Countywide Analysis

Hydraulic studies for the streams previously studied by detailed methods and have been redelineated for this study. Also, new detailed studies were performed for Devall Branch, Two Mile Creek and Unnamed Tributary using USACE HEC-RAS Version 4.0 (Reference 25). Water Surface Elevations were found using normal depth method.

Cross sections for flooding sources studied by detailed methods were obtained from field surveys. All bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood profiles (Exhibit 1). For stream segments form which a floodway was computed (Section 4.2), selected cross section locations are also shown on the FIRM (Exhibit 2).

Channel roughness factors (Manning’s “n”) used in the hydraulic computations were chosen by engineering judgment and based on field observations. The channel and overbank “n” values for the streams studied by detailed methods are listed in Table 4, “Summary of Roughness Coefficients”.

Table 4 – Summary of Roughness Coefficients

	Manning's "n"	
Stream Name	Channel	Overbank
Acosta Creek	0.070-0.100	0.100-0.150
Devall Branch	0.030-0.060	0.055-0.100
Dunns Creek	0.030-0.035	0.120-0.150
Etonia Creek	0.070	0.200
Falling Branch	0.026-0.065	0.150
Gum Creek	0.020-0.150	0.025-0.0150
Simms Creek	0.070	0.150
Tributary 1 to Simms Creek	0.025-0.070	0.100-0.150
Tributary 1-A to Simms Creek	0.070	0.150
Tributary 2 to Simms Creek	0.030-0.070	0.100-0.150
Two Mile Creek	0.0350-0.040	0.060-0.120
Unnamed Tributary	0.0350-0.040	0.060-0.090

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum in use for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD29). With the finalization of the North American Vertical Datum of 1988 (NAVD88), many FIS reports and FIRMs are being prepared using NAVD88 as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD88 (unless otherwise noted). Structure and ground elevations in the community must, therefore, be referenced to NAVD88. The datum shift value in Putnam County to convert from NGVD29 to NAVD88 is -0.94 feet.

For more information on NAVD88, see the FEMA publication entitled *Converting the National Flood Insurance Program to the North American Vertical Datum of 1988* (FEMA, June 1992), or contact the Vertical Network Branch, National Geodetic Survey, Coast and Geodetic Survey, National Oceanic and Atmospheric Administration, Rockville, Maryland 20910 (Internet address http://www.ngs.noaa.gov).

No temporary vertical monuments were established during the preparation of this flood hazard analysis.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages state and local governments to adopt sound floodplain management programs. Therefore, each FIS provides 1-percent-annual-chance flood elevations and delineations of the 1- and 0.2-percent-annual-chance floodplain boundaries and 1-percent-annual-chance floodway to assist communities in developing floodplain management measures. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles and the Floodway Data Table. Users should reference the data presented in the FIS report as well as additional information that may be available at the local map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the county. For each stream studied in detail, the 1-percent-annual-chance and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section.

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM (Exhibit 2). On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE); and the 0.2 percent-annual chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

Terrain data used for Putnam County floodplain mapping included LiDAR data and DEM data. The LiDAR data covered 258 square miles within Putnam County and was provided by the Florida Division of Emergency Management (Reference 26). The DEM data, 1/3-Arc Second National Elevation Dataset, covers the remaining 586 square miles of Putnam County and was from the USGS (Reference 27)

For the streams studied by approximate methods, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM (Exhibit 2).

4.2 Floodways

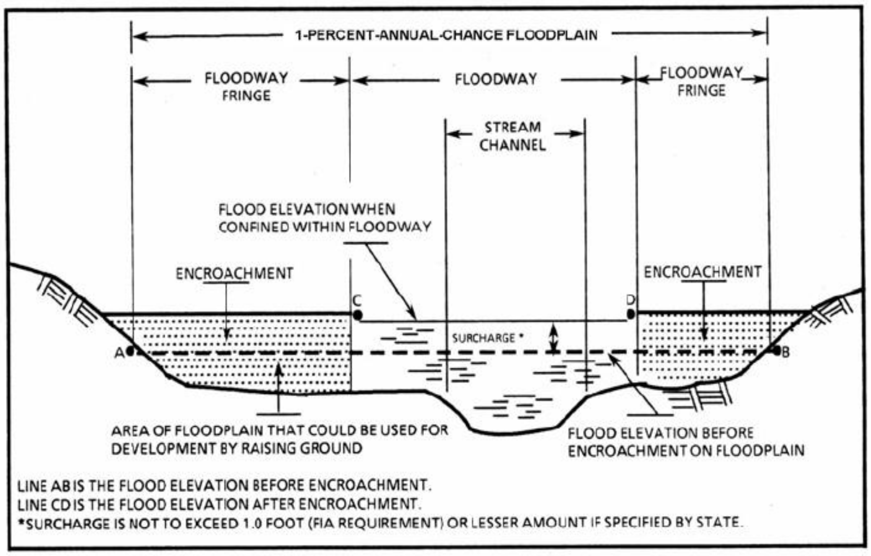
Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent-annual-chance flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 5). The computed floodways are shown on the FIRM (Exhibit 2). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

Encroachment into areas subject to inundation by floodwaters having hazardous velocities aggravates the risk of flood damage, and heightens potential flood hazards by further increasing velocities. A listing of stream velocities at selected cross sections is provided in Table 5. In order to reduce the risk of property damage in areas where the stream velocities are high, the county may wish to restrict development in areas outside the floodway.

The area between the floodway and the 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 1-percent-annual-chance flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1.

Figure 1 – Floodway Schematic



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5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs or base flood depths are shown within this zone.

Zone AE

Zone AE is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS by detailed methods. In most instances, whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance risk zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by levees. No BFEs or base flood depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent-annual-chance floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols the 1- and 0.2-percent-annual-chance floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The countywide Flood Insurance Rate Map presents flooding information for the geographic area of Putnam County. Previously, separate Flood Hazard Boundary Maps and/or Flood Insurance Rate Maps were prepared for each flood-prone incorporated community and the unincorporated areas of the County. Historical data relating to the maps prepared for each community are presented in Table 3, “Community Map History”.

Insert CMHT

7.0 OTHER STUDIES

The previous Flood Insurance Study for Putnam County is in agreement with this study (Reference 5). FIS reports have been prepared for St. Johns County, Clay County, Alachua County, Marion County, Volusia County, and Flagler County, Florida (References 28, 29, 30, 31, 32, and 33.

Information pertaining to revised and unrevised flood hazards for each jurisdiction within Putnam County has been compiled into this FIS. Therefore, this FIS report supersedes or is compatible with all previously printed FIS reports, FIRMs, and FBFMs for all jurisdictions within Putnam County and should be considered authoritative for the purposes of the NFIP.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting Federal Emergency Management Agency, Region IV, Flood Insurance and Mitigation Division, Koger-Center, Rutgers Building, 3003 Chamblee-Tucker Road, Atlanta, Georgia 30341.

Future revisions may be made that do not result in the republishing of the Flood Insurance Study report. To ensure that any user is aware of all revisions, it is advisable to contact the map repository of flood hazard data located in the community.

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