CHAPTER 3: WATERSHED HYDROLOGY
APPENDIX 3.J: 04-MIDDLE ST. JOHNS RIVER CALIBRATION

4A ECONLOCKHATCHEE RIVER WATERSHED

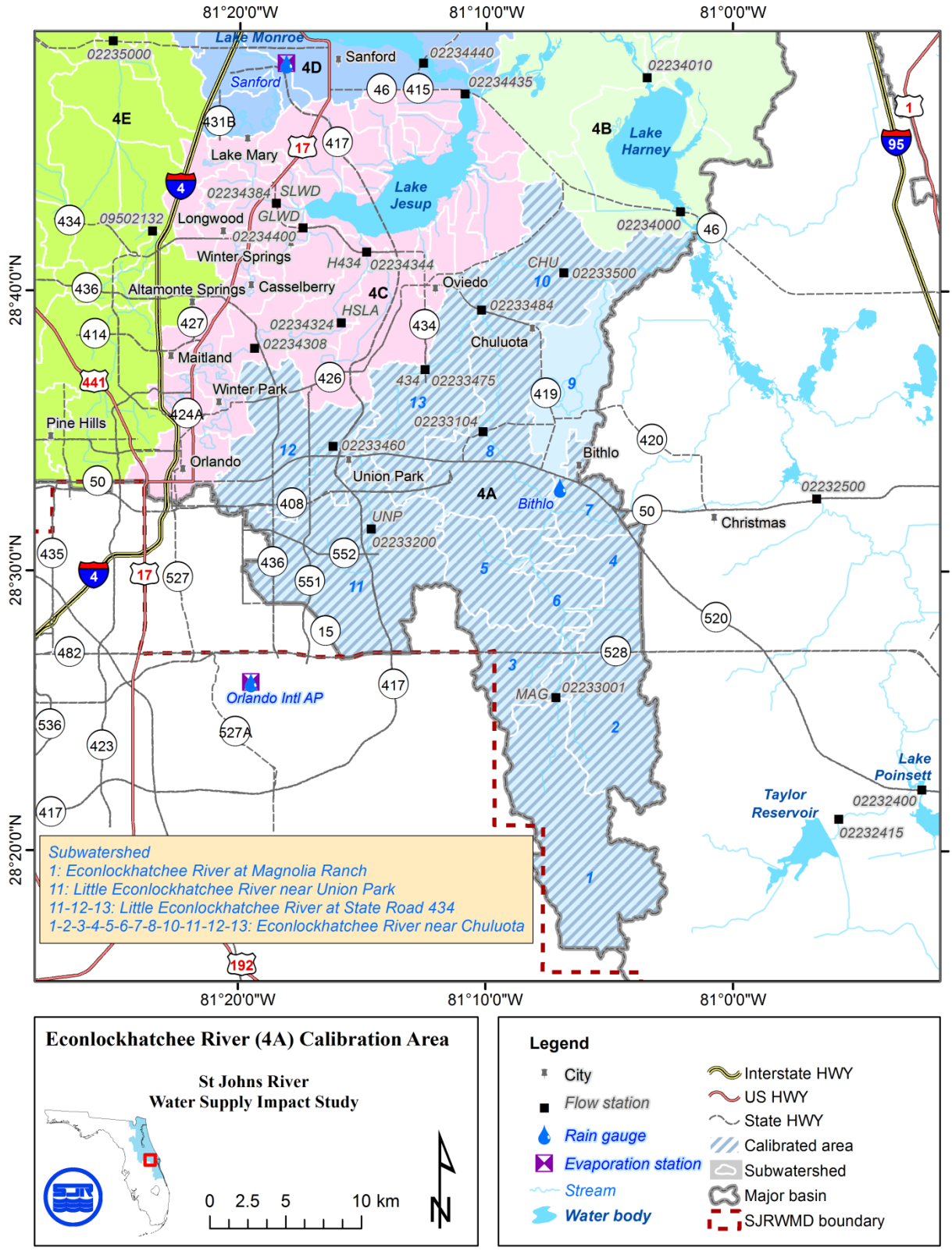

Figure 3.J.1: 4A Econlockhatchee River Watershed calibration areas

4A ECONLOCKHATCHEE RIVER WATERSHED. ECONLOCKHATCHEE RIVER AT MAGNOLIA RANCH SUBWATERSHEDS

A variety of HSPF hydrologic parameters relating to watershed storage, infiltration, evaporation, and deep percolation are adjusted in the hydrologic calibration process to match the observed flows at four USGS flow stations: Econlockhatchee River at Magnolia Ranch near Bithlo (USGS 02233001), Little Econlockhatchee River near Union Park (USGS 02233200), Little Econlockhatchee River at SR434 near Oviedo (USGS 02233475), and Econlockhatchee River near Chuluota (USGS 02233500). The extents of adjustment for these hydrologic parameters are generally within their reasonable ranges reported in USEPA (2000) and in the HSPF Common Logic.

The daily hydrographs in the following subsection compare the simulated flows and the observed flows at the four calibration sites over the calibration period 10/1995 – 09/2006. It can be seen that good agreement is achieved between the simulated flows and the observed flows. In addition, the performance of hydrologic simulation is evaluated using several statistical measures recommended by HSPEXP (Lumb et al. 1994), an expert system for calibration of HSPF. These statistical measures are also suggested in a technical memorandum of the SJRWMD for HSPF calibration (Bergman 2003). The statistical measures evaluate the fitness between simulated and observed flows in terms of mass balance, low flow recession, high-flow/low-flow distribution, and seasonal distribution. As shown in the calibration statistics tables in the following subsection, the hydrologic calibration generally performs very well.

During the process of hydrologic calibration, the daily flow-frequency duration curves and the correlation of simulated and observed daily flows are evaluated. In addition, simulated and observed stages are compared at the calibration sites. Furthermore, the comparison of simulated and observed flows is performed for monthly values. The plots for some of these comparisons are provided in the following subsection. Based on the results of hydrologic calibration, it is concluded that the HSPF model adequately represents the hydrologic processes of the watershed.

Table 3.J.1: Calibration Model Performance

Nash-Sutcliffe (Monthly Mean Flow)	Percent Error of the Mean
0.22	17.88

Table 3.J.2: Descriptive Calibration Statistics

Statistic (Daily Flow (mgd))	Observed (USGS:02233001)	Simulated
Average	18.58	21.90
Median	1.75	2.62
Variance	1213.41	1667.42
Standard Deviation	34.83	40.83
Skew	2.85	2.67
Kurtosis	9.78	8.27
Minimum	0.00	0.00
Maximum	252.71	290.62
Range	252.71	290.62

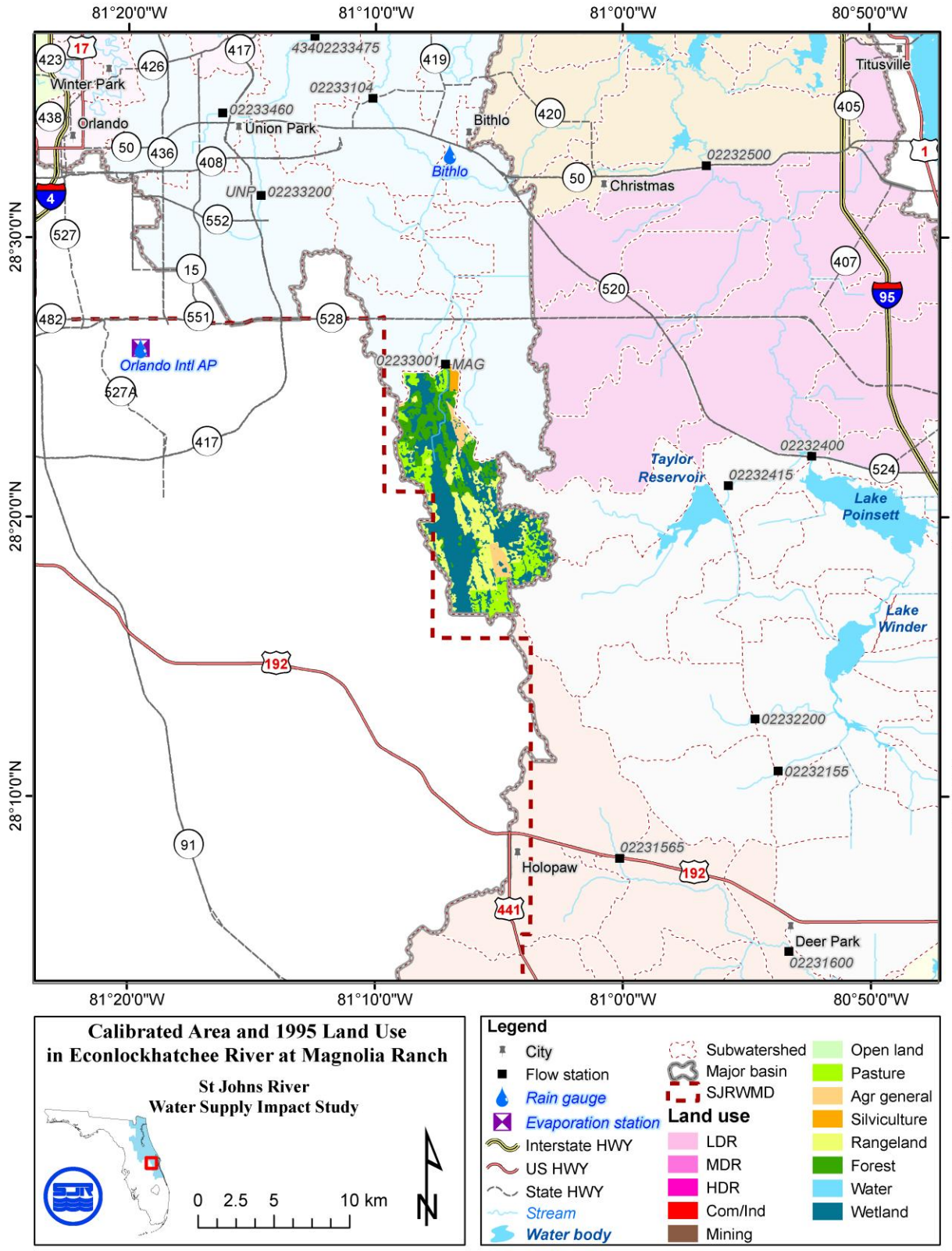

Figure 3.J.2: Econlockhatchee River at Magnolia Ranch land use map

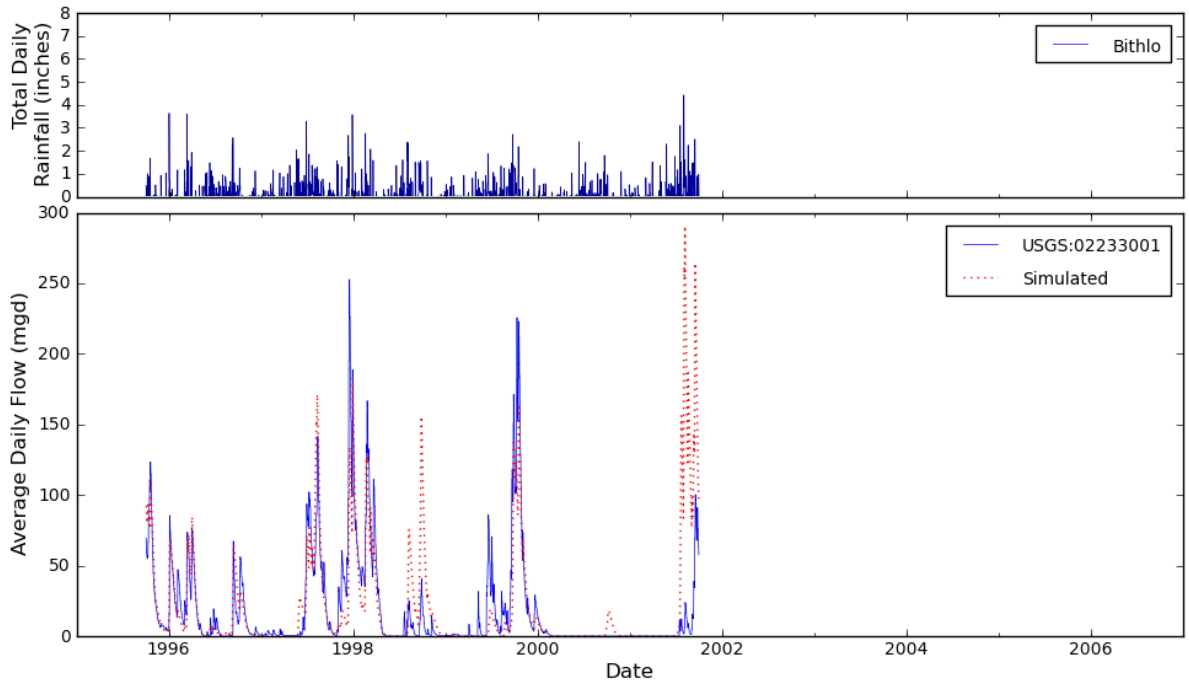

Figure 3.J.3: Econlockhatchee River at Magnolia Ranch daily hydrograph

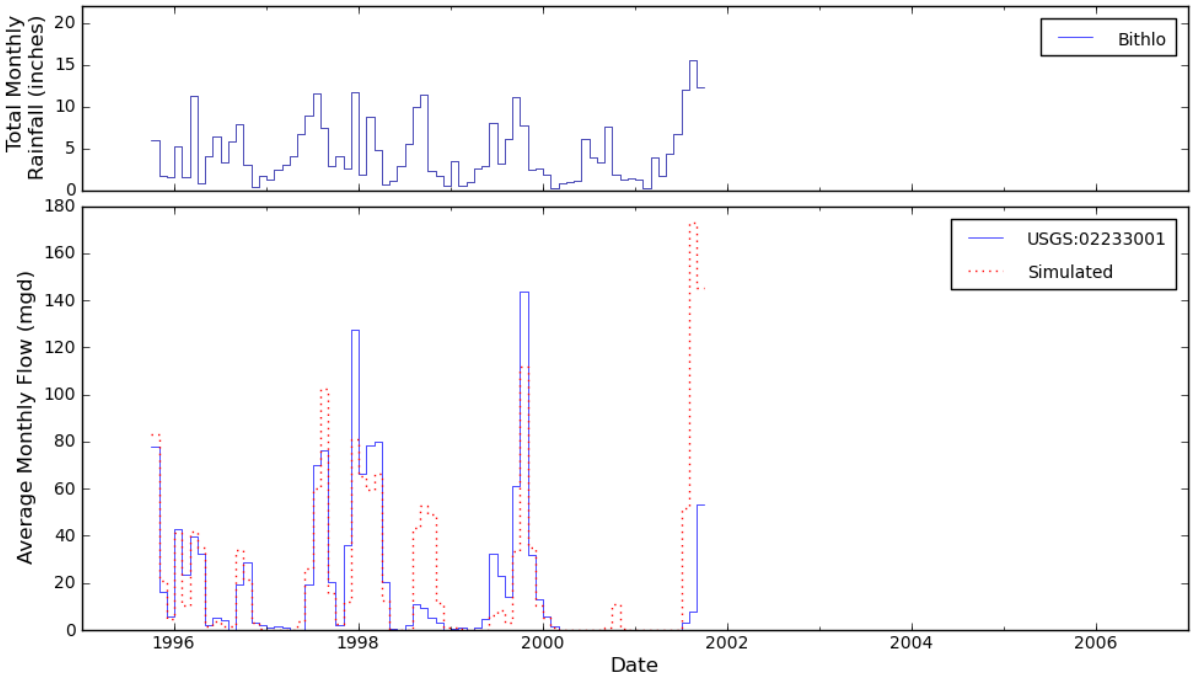

Figure 3.J.4: Econlockhatchee River at Magnolia Ranch monthly hydrograph

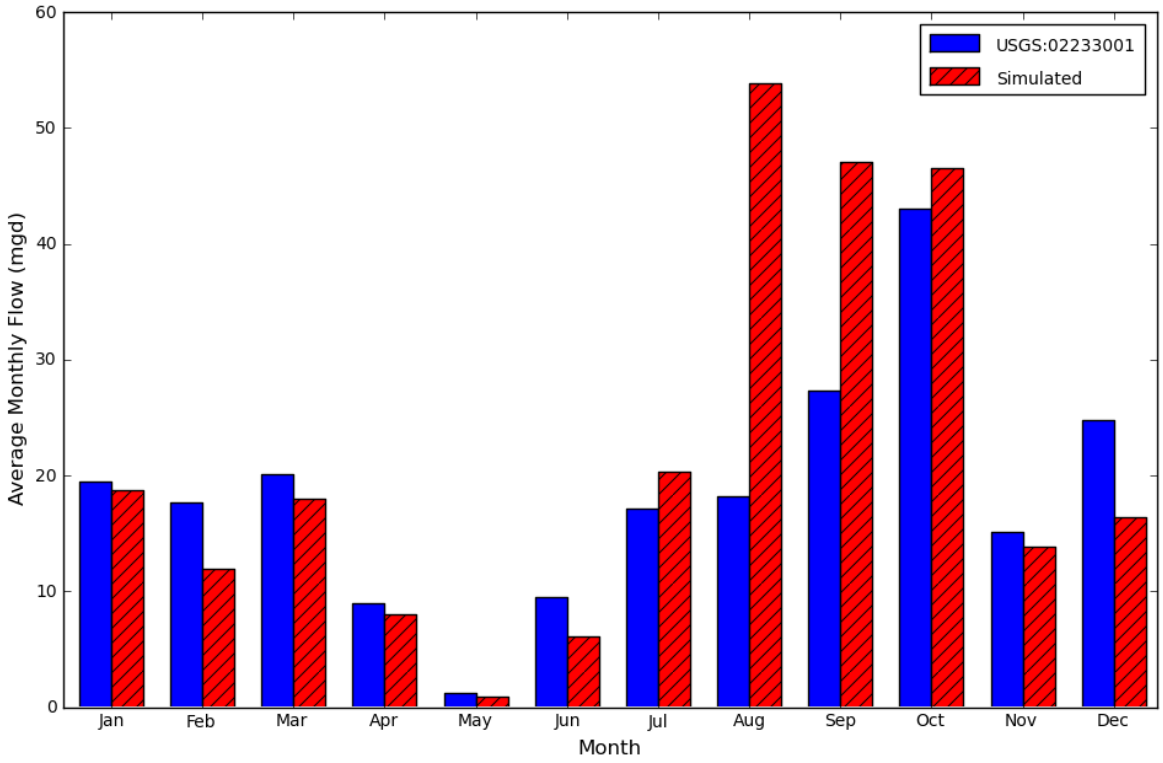

Figure 3.J.5: Econlockhatchee River at Magnolia Ranch average monthly flow

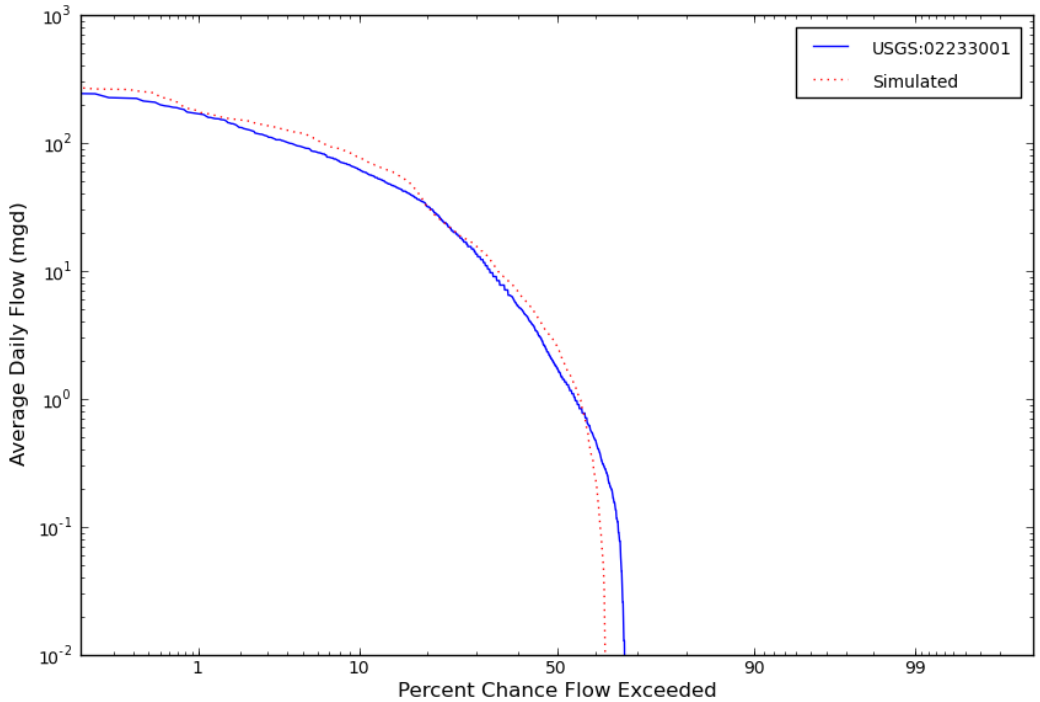

Figure 3.J.6: Econlockhatchee River at Magnolia Ranch exceedance probability curve

4A ECONLOCKHATCHEE RIVER WATERSHED. LITTLE ECONLOCKHATCHEE RIVER NEAR UNION PARK SUBWATERSHEDS

Please refer to discussion in appendix describing "4A Econlockhatchee River Watershed: Econlockhatchee River at Magnolia Ranch Subwatersheds"

Table 3.J.3: Calibration Model Performance

Nash-Sutcliffe (Monthly Mean Flow)	Percent Error of the Mean
0.61	-5.62

Table 3.J.4: Descriptive Calibration Statistics

Statistic (Daily Flow (mgd))	Observed (USGS:02233200)	Simulated
Average	26.30	24.82
Median	13.57	13.88
Variance	1886.38	1402.65
Standard Deviation	43.43	37.45
Skew	7.71	4.67
Kurtosis	96.44	32.29
Minimum	0.84	0.95
Maximum	833.75	507.30
Range	832.91	506.35

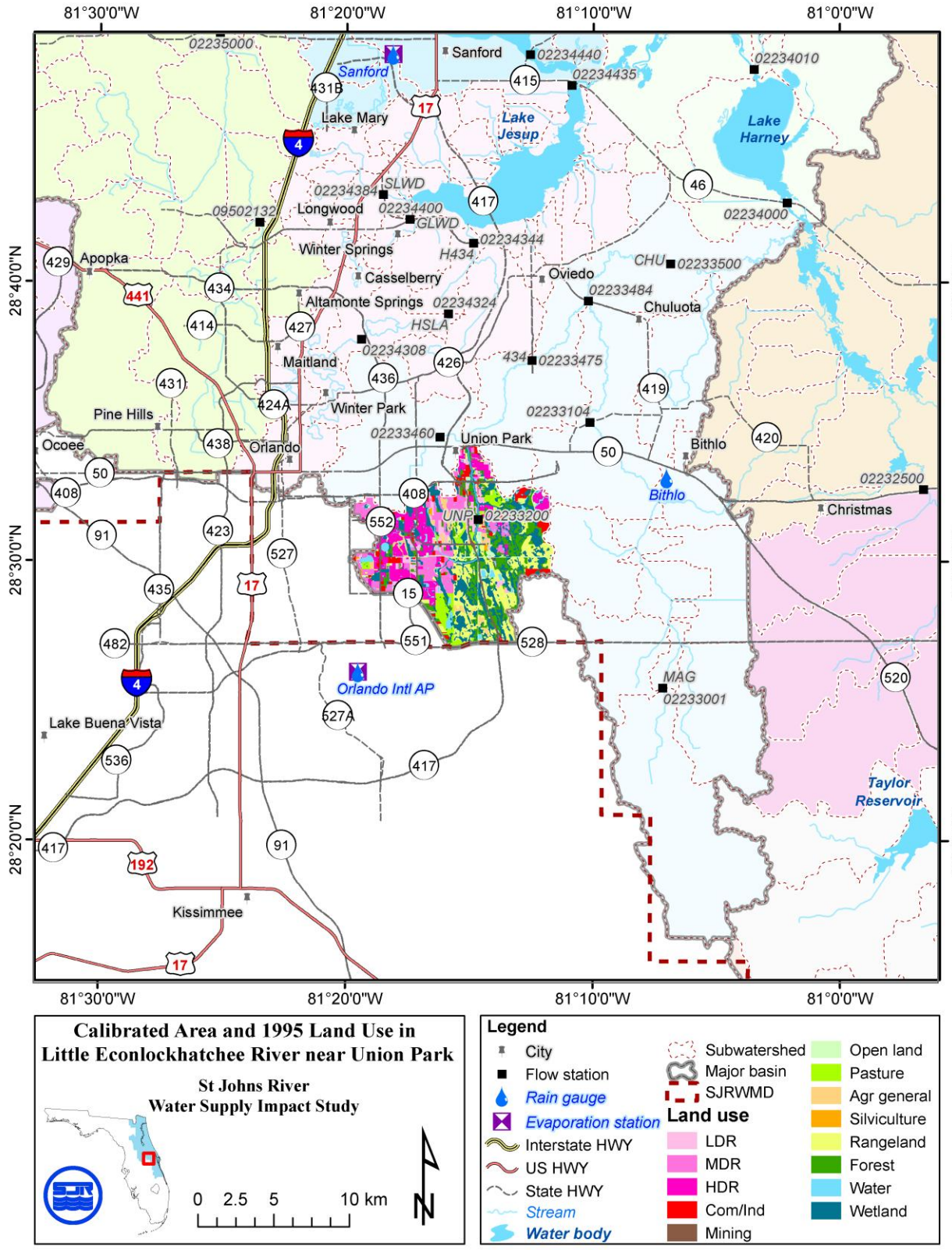

Figure 3.J.7: Little Econlockhatchee River near Union Park land use map

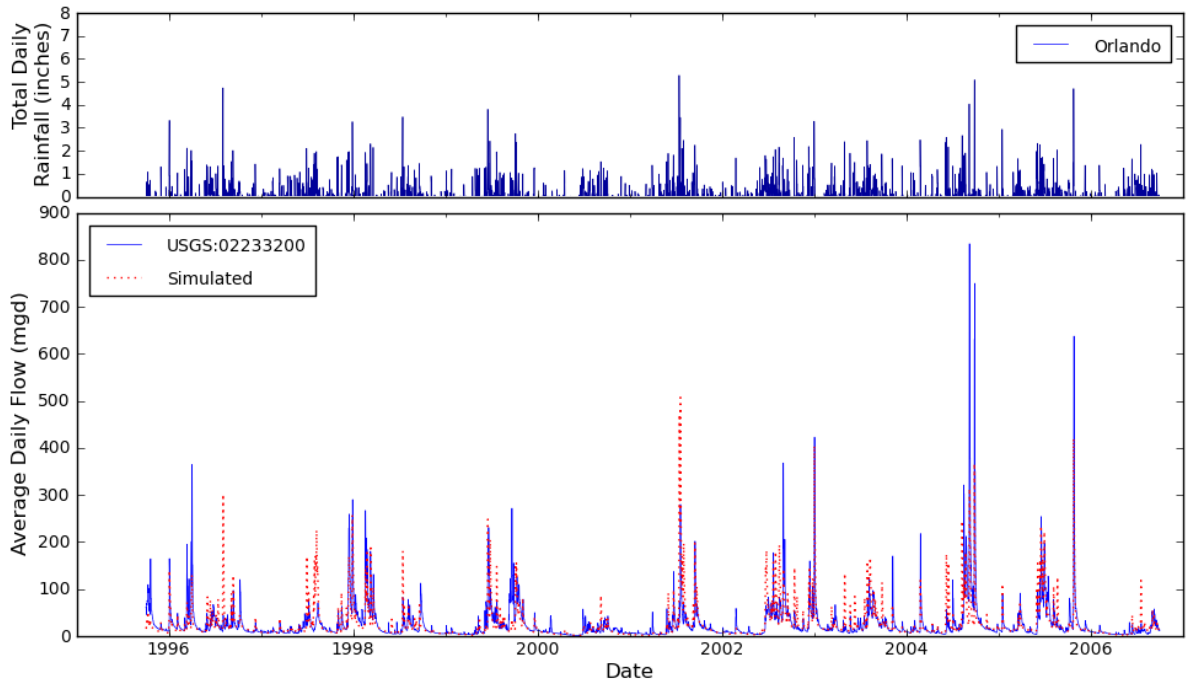

Figure 3.J.8: Little Econlockhatchee River near Union Park daily hydrograph

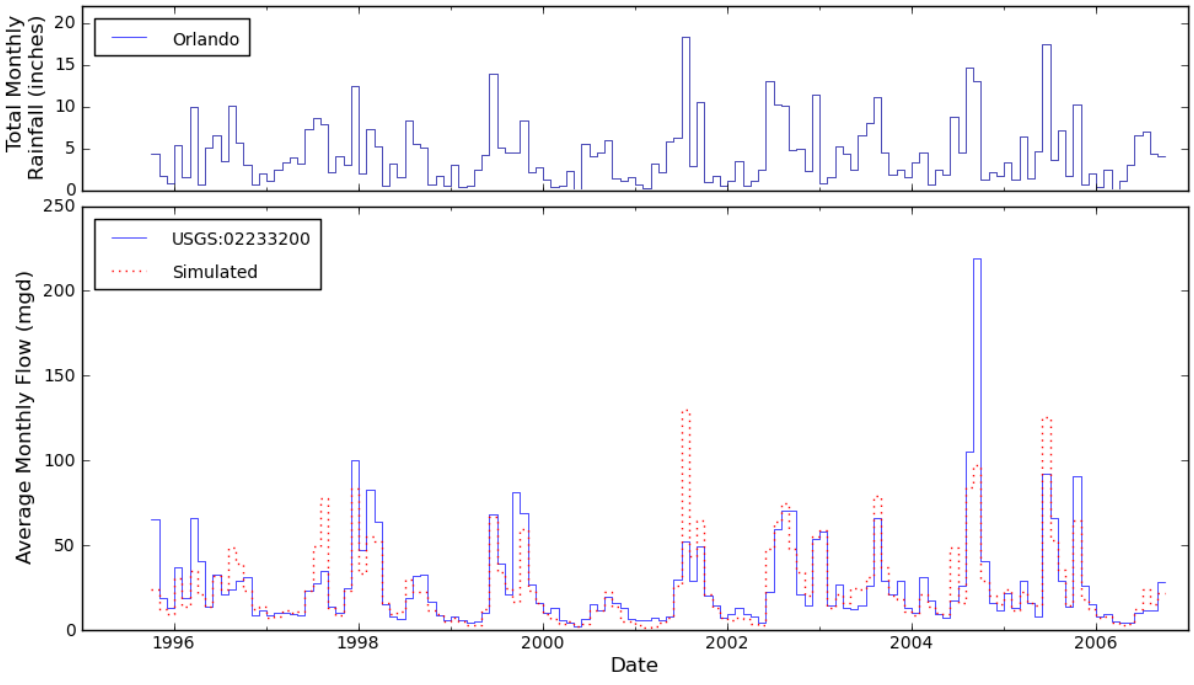

Figure 3.J.9: Little Econlockhatchee River near Union Park monthly hydrograph

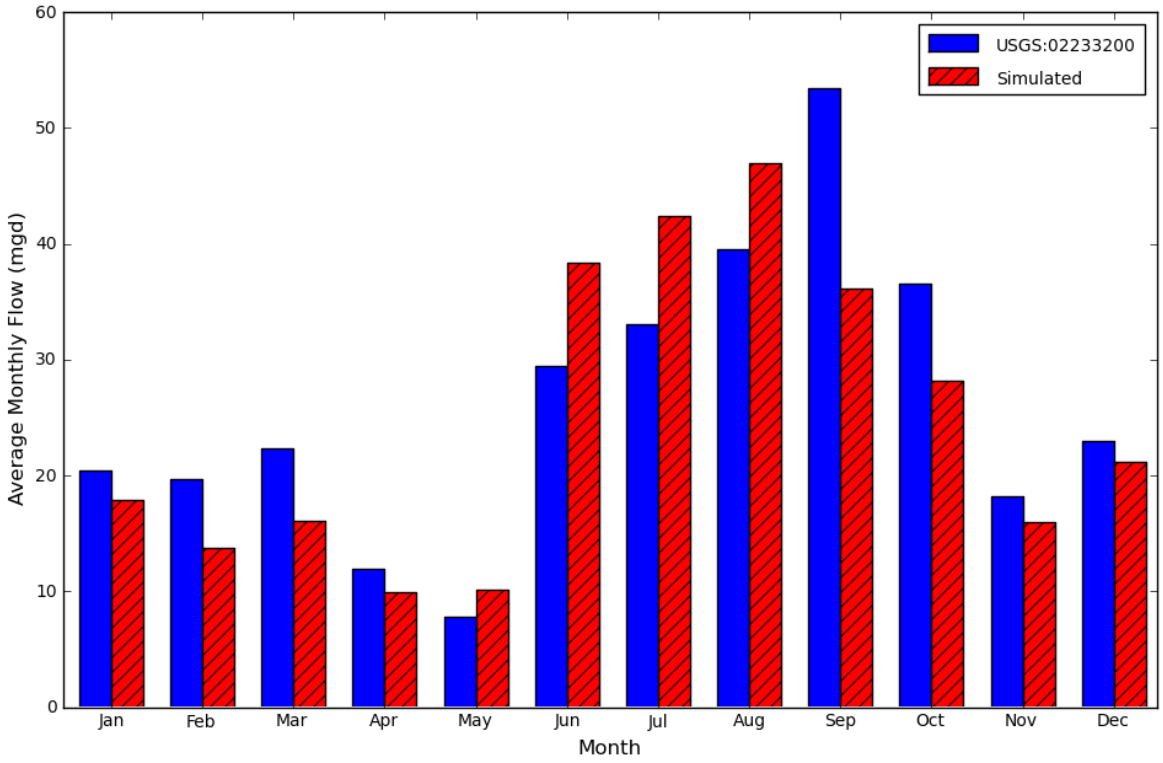

Figure 3.J.10: Little Econlockhatchee River near Union Park average monthly flow

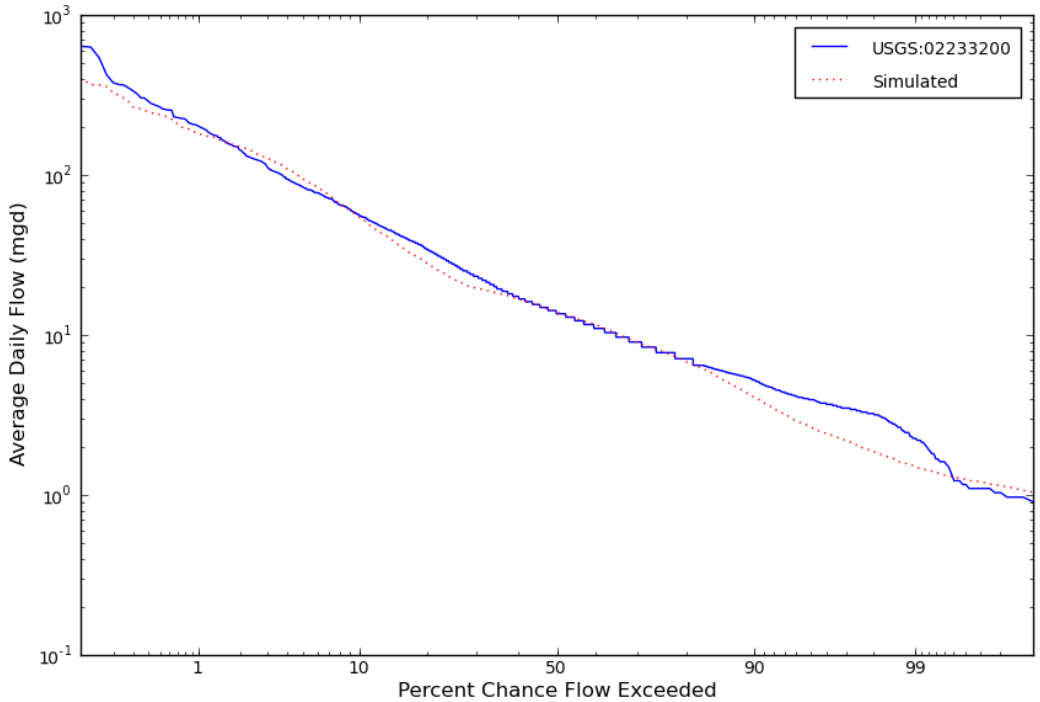

Figure 3.J.11: Little Econlockhatchee River near Union Park exceedance probability curve

4A ECONLOCKHATCHEE RIVER WATERSHED. LITTLE ECONLOCKHATCHEE RIVER AT STATE ROAD 434 SUBWATERSHEDS

Please refer to discussion in appendix describing "4A Econlockhatchee River Watershed: Econlockhatchee River at Magnolia Ranch Subwatersheds"

Table 3.J.5: Calibration Model Performance

Nash-Sutcliffe (Monthly Mean Flow)	Percent Error of the Mean
0.83	-3.00

Table 3.J.6: Descriptive Calibration Statistics

Statistic (Daily Flow (mgd))	Observed (USGS:02233475)	Simulated
Average	91.12	88.39
Median	47.18	48.96
Variance	11414.95	11727.78
Standard Deviation	106.84	108.29
Skew	3.04	3.47
Kurtosis	14.00	18.21
Minimum	7.11	11.66
Maximum	1202.15	1372.81
Range	1195.04	1361.15

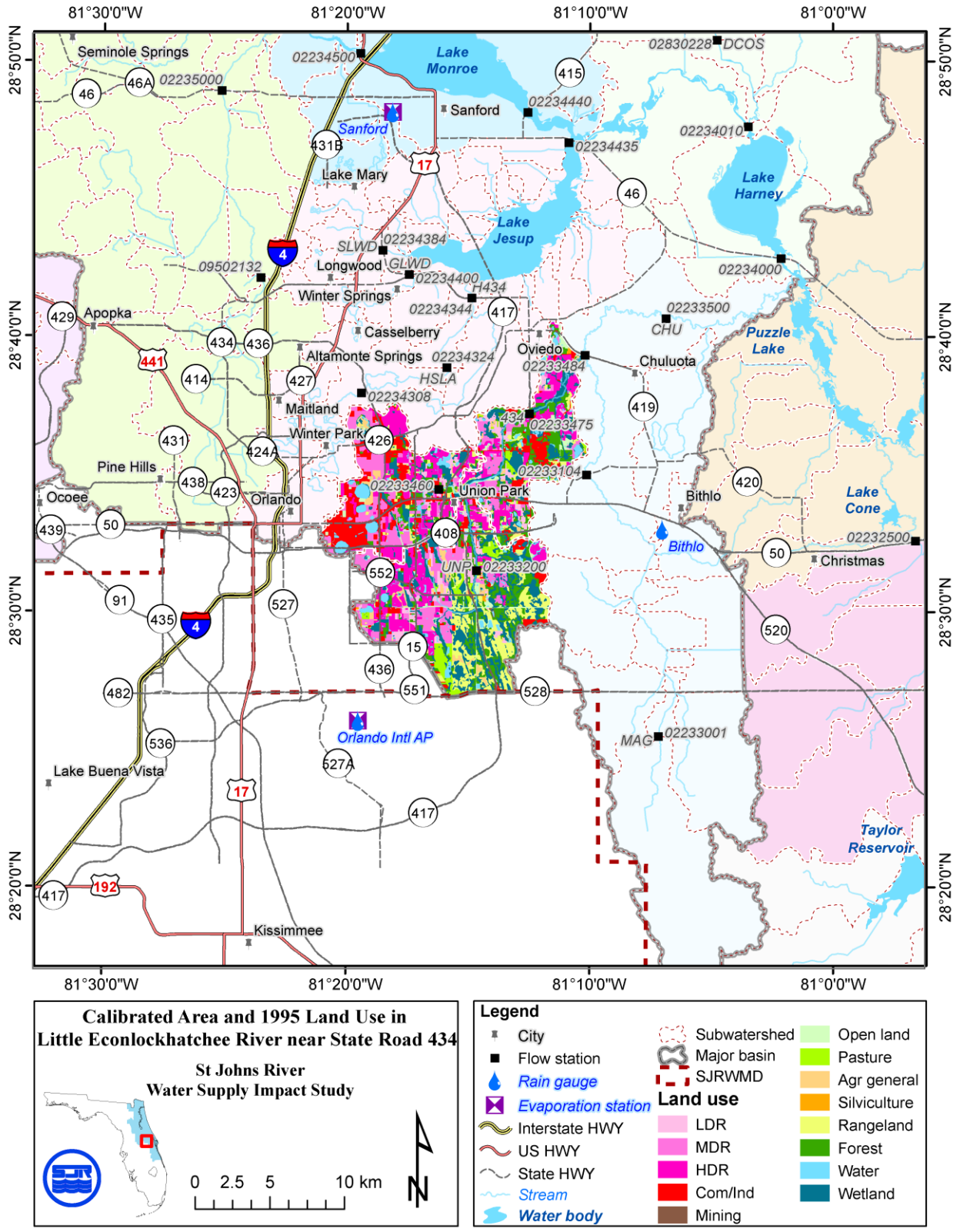

Figure 3.J.12: Little Econlockhatchee River at State Road 434 land use map

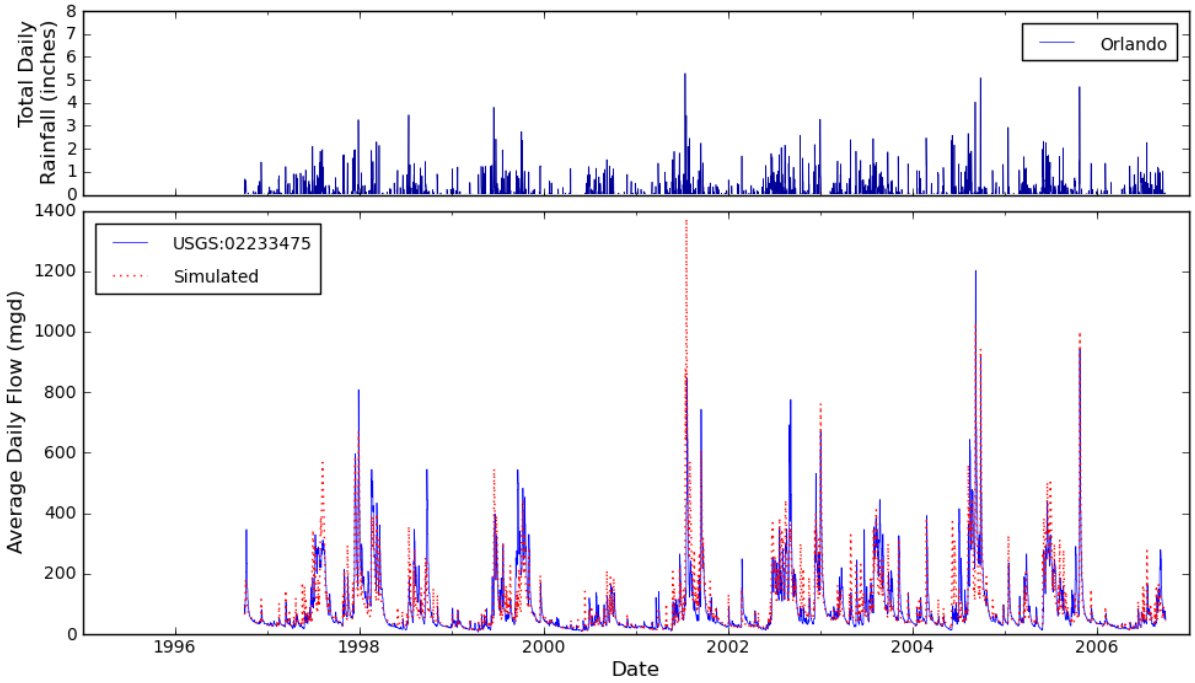

Figure 3.J.13: Little Econlockhatchee River at State Road 434 daily hydrograph

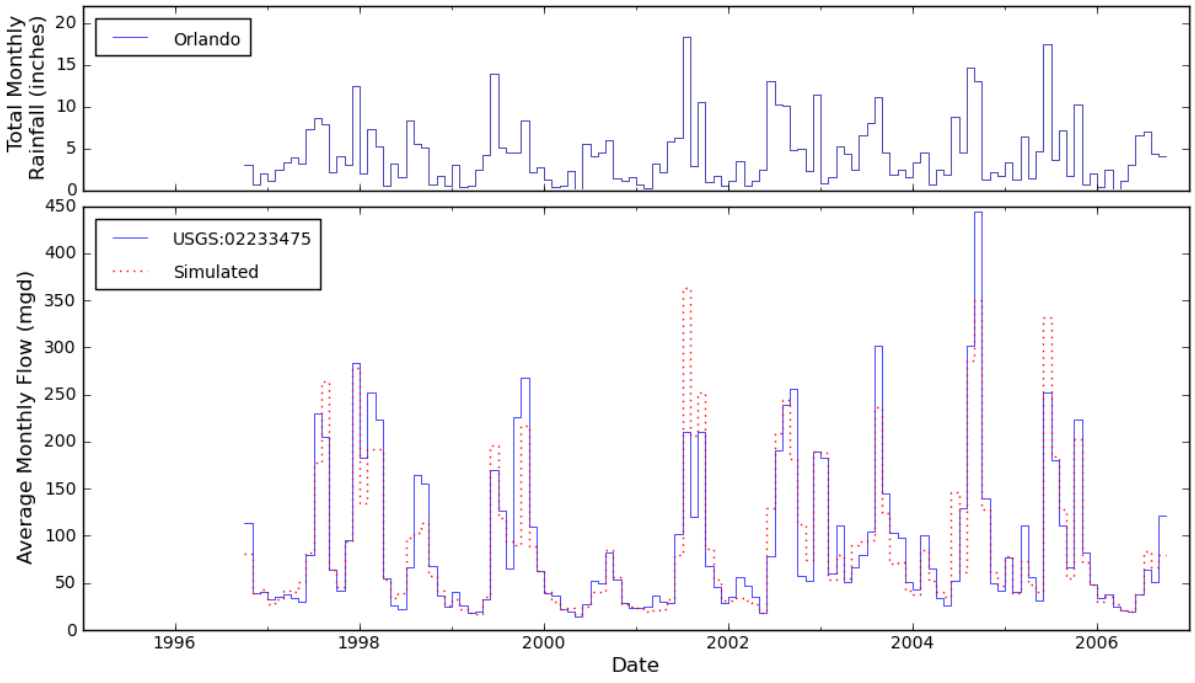

Figure 3.J.14: Little Econlockhatchee River at State Road 434 monthly hydrograph

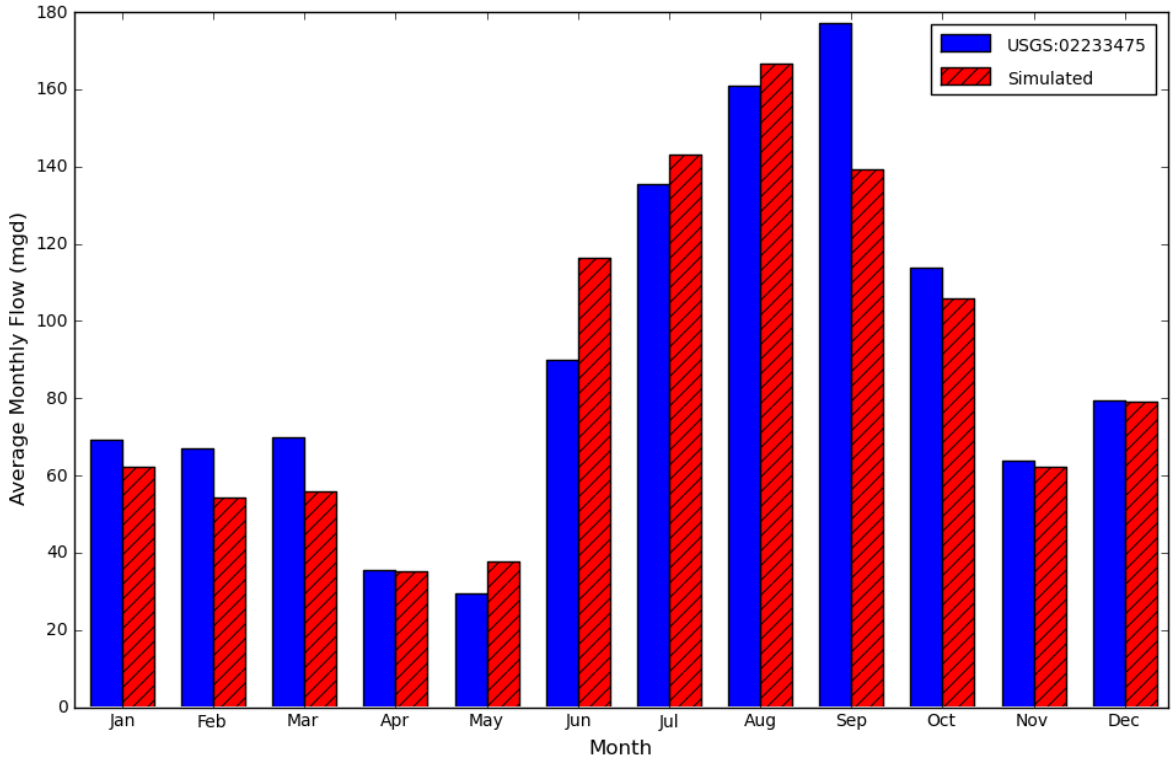

Figure 3.J.15: Little Econlockhatchee River at State Road 434 average monthly flow

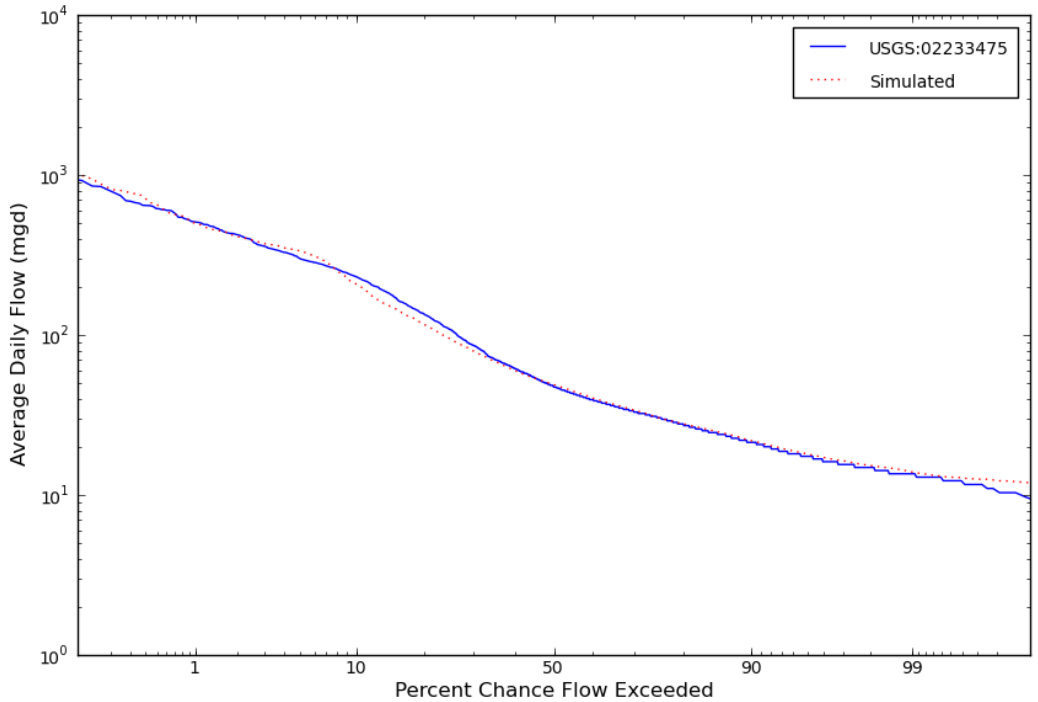

Figure 3.J.16: Little Econlockhatchee River at State Road 434 exceedance probability curve

4A ECONLOCKHATCHEE RIVER WATERSHED. ECONLOCKHATCHEE RIVER NEAR CHULUOTA SUBWATERSHEDS

Please refer to discussion in appendix describing "4A Econlockhatchee River Watershed: Econlockhatchee River at Magnolia Ranch Subwatersheds"

Table 3.J.7: Calibration Model Performance

Nash-Sutcliffe (Monthly Mean Flow)	Percent Error of the Mean
0.72	-1.23

Table 3.J.8: Descriptive Calibration Statistics

Statistic (Daily Flow (mgd))	Observed (USGS:02233500)	Simulated
Average	221.93	219.19
Median	100.18	98.75
Variance	99047.72	98036.99
Standard Deviation	314.72	313.11
Skew	3.57	3.29
Kurtosis	18.89	14.65
Minimum	18.74	13.21
Maximum	3677.54	3047.38
Range	3658.80	3034.17

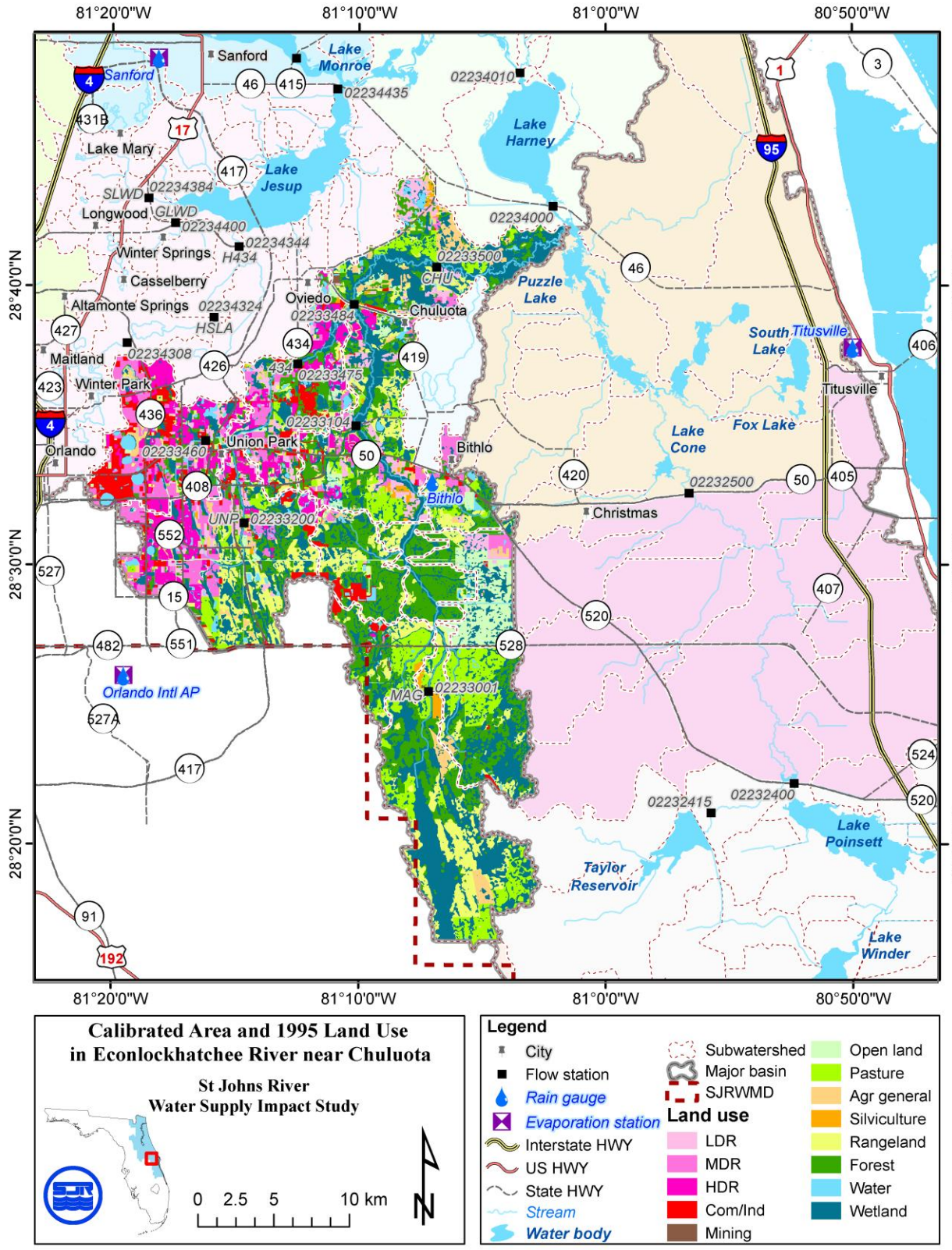

Figure 3.J.17: Econlockhatchee River near Chuluota land use map

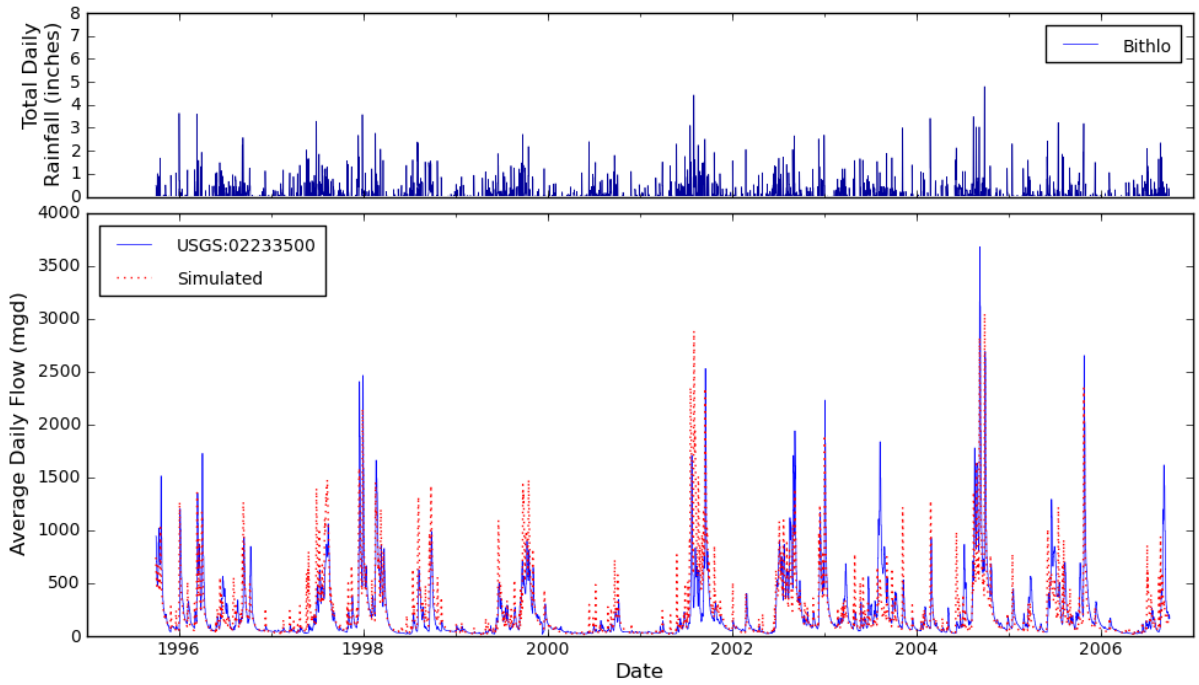

Figure 3.J.18: Econlockhatchee River near Chuluota daily hydrograph

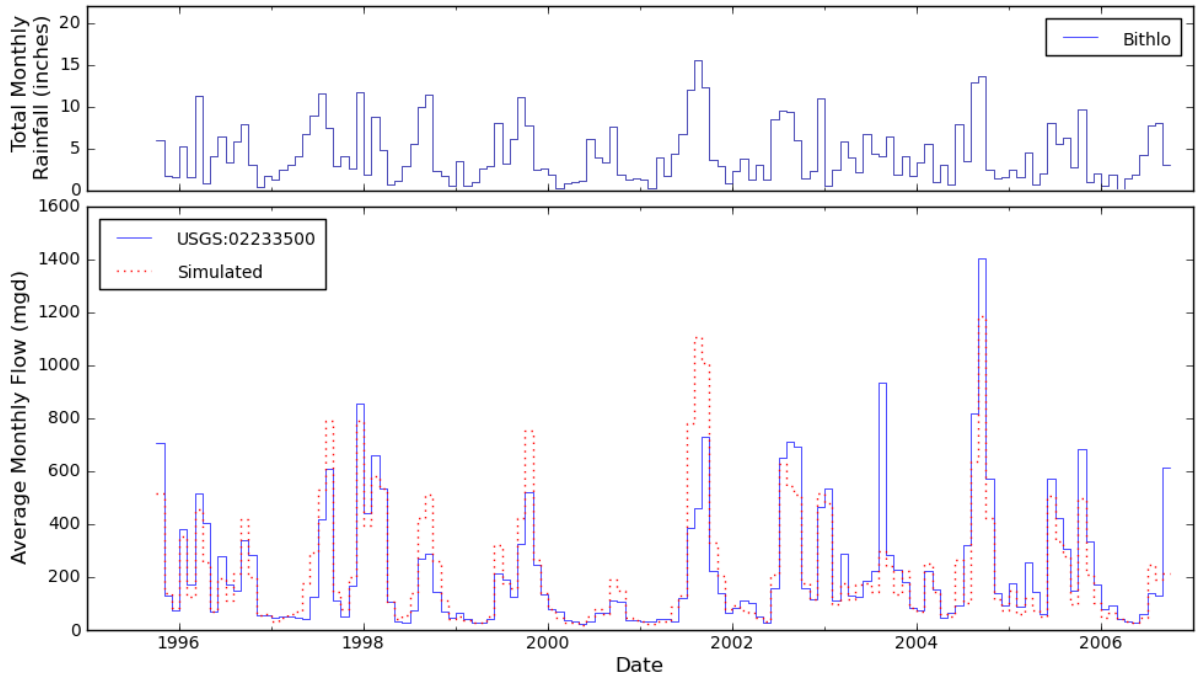

Figure 3.J.19: Econlockhatchee River near Chuluota monthly hydrograph

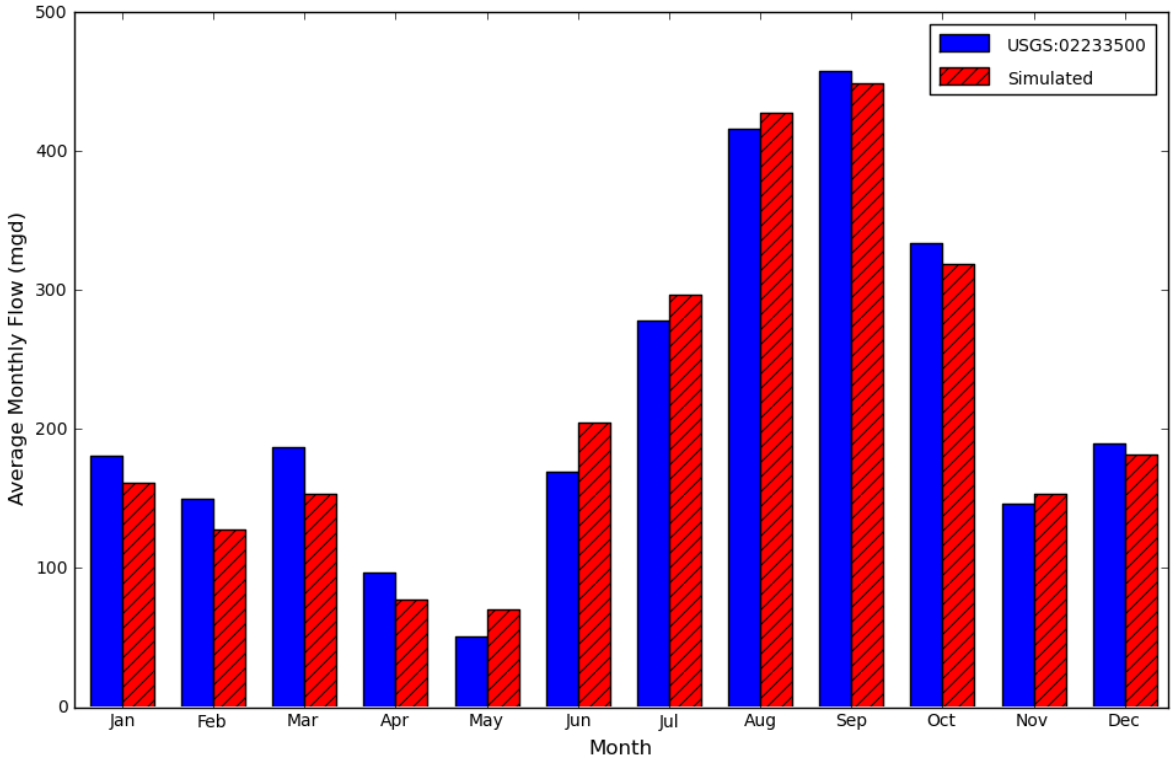

Figure 3.J.20: Econlockhatchee River near Chuluota average monthly flow

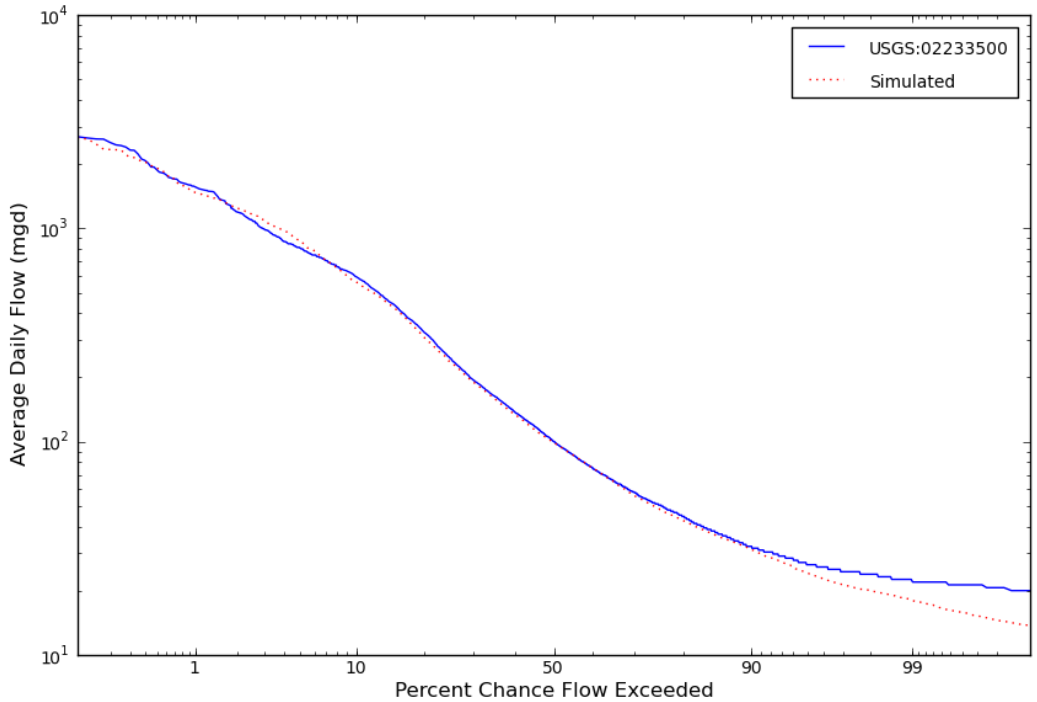

Figure 3.J.21: Econlockhatchee River near Chuluota exceedance probability curve

4B DEEP CREEK WATERSHED

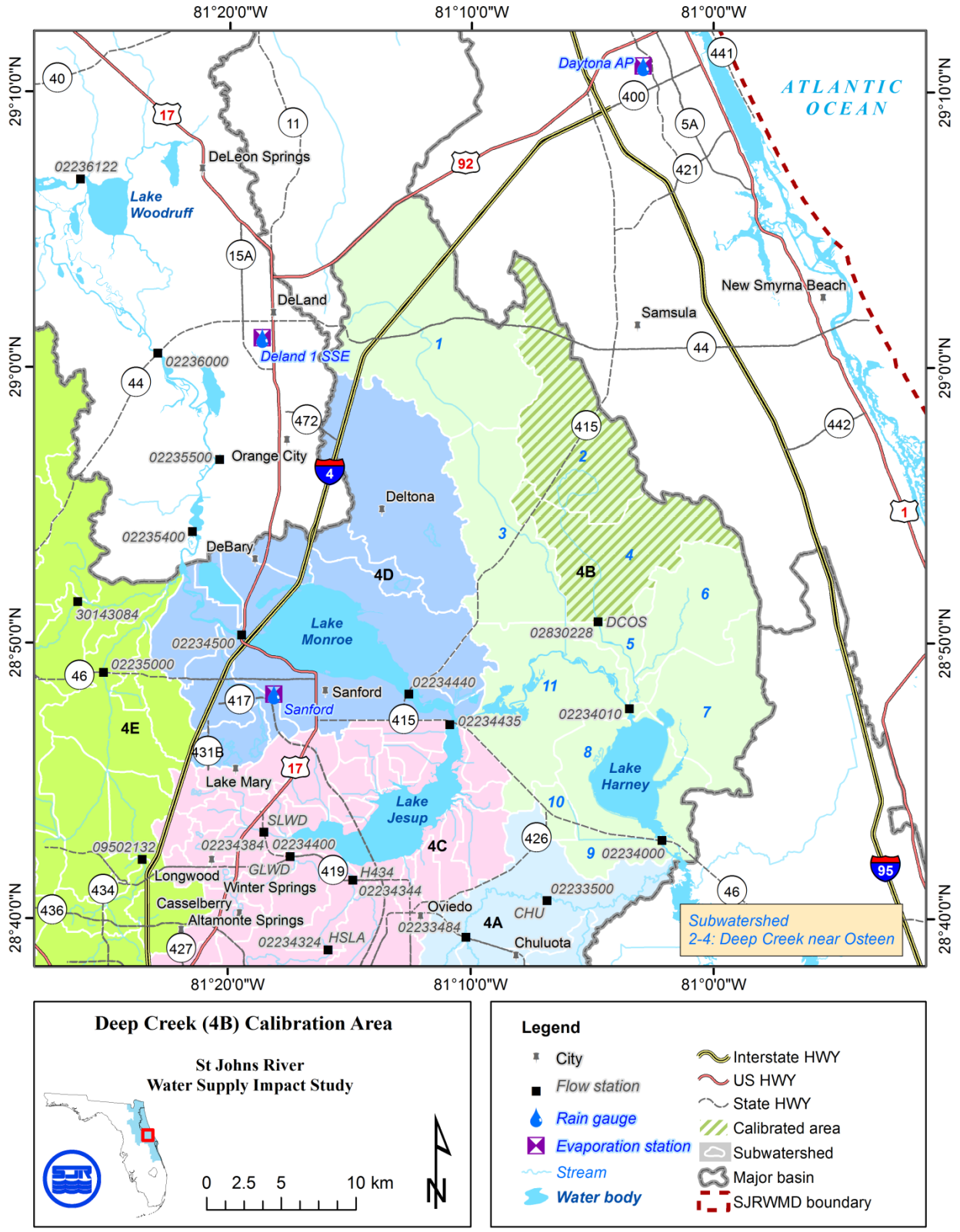

Figure 3.J.22: 4B Deep Creek Watershed calibration areas

4B DEEP CREEK WATERSHED. DEEP CREEK NEAR OSTEEN SUBWATERSHEDS

A variety of HSPF hydrologic parameters relating to watershed storage, infiltration, evaporation, and deep percolation are adjusted in the hydrologic calibration process to match the observed flows at USGS flow station, Deep Creek near Osteen (USGS 02234100). The extents of adjustment for these hydrologic parameters are generally within their reasonable ranges reported in USEPA (2000) and in the HSPF Common Logic.

The daily hydrograph in the following subsection compares the simulated flows and the observed flows at the calibration site over the calibration period 10/1996 – 09/2006. It can be seen that good agreement is achieved between the simulated flows and the observed flows. The statistical measures evaluating the fitness between simulated and observed flows are provided in the calibration statistics tables in the following subsection. During the process of hydrologic calibration, the daily flow-frequency duration curves and the correlation of simulated and observed daily flows are evaluated. In addition, simulated and observed stages are compared at the calibration site. Furthermore, the comparison of simulated and observed flows is performed for monthly values. The plots for some of these comparisons are provided in the following subsection. Based on the results of hydrologic calibration, it is concluded that the HSPF model adequately represents the hydrologic processes of the watershed.

Table 3.J.9: Calibration Model Performance

Nash-Sutcliffe (Monthly Mean Flow)	Percent Error of the Mean
0.79	0.08

Table 3.J.10: Descriptive Calibration Statistics

Statistic (Daily Flow (mgd))	Observed (USGS:02234100)	Simulated
Average	39.82	39.86
Median	9.05	9.40
Variance	7407.54	6101.06
Standard Deviation	86.07	78.11
Skew	7.99	4.88
Kurtosis	112.42	40.20
Minimum	0.00	0.00
Maximum	1673.96	1209.87
Range	1673.96	1209.87

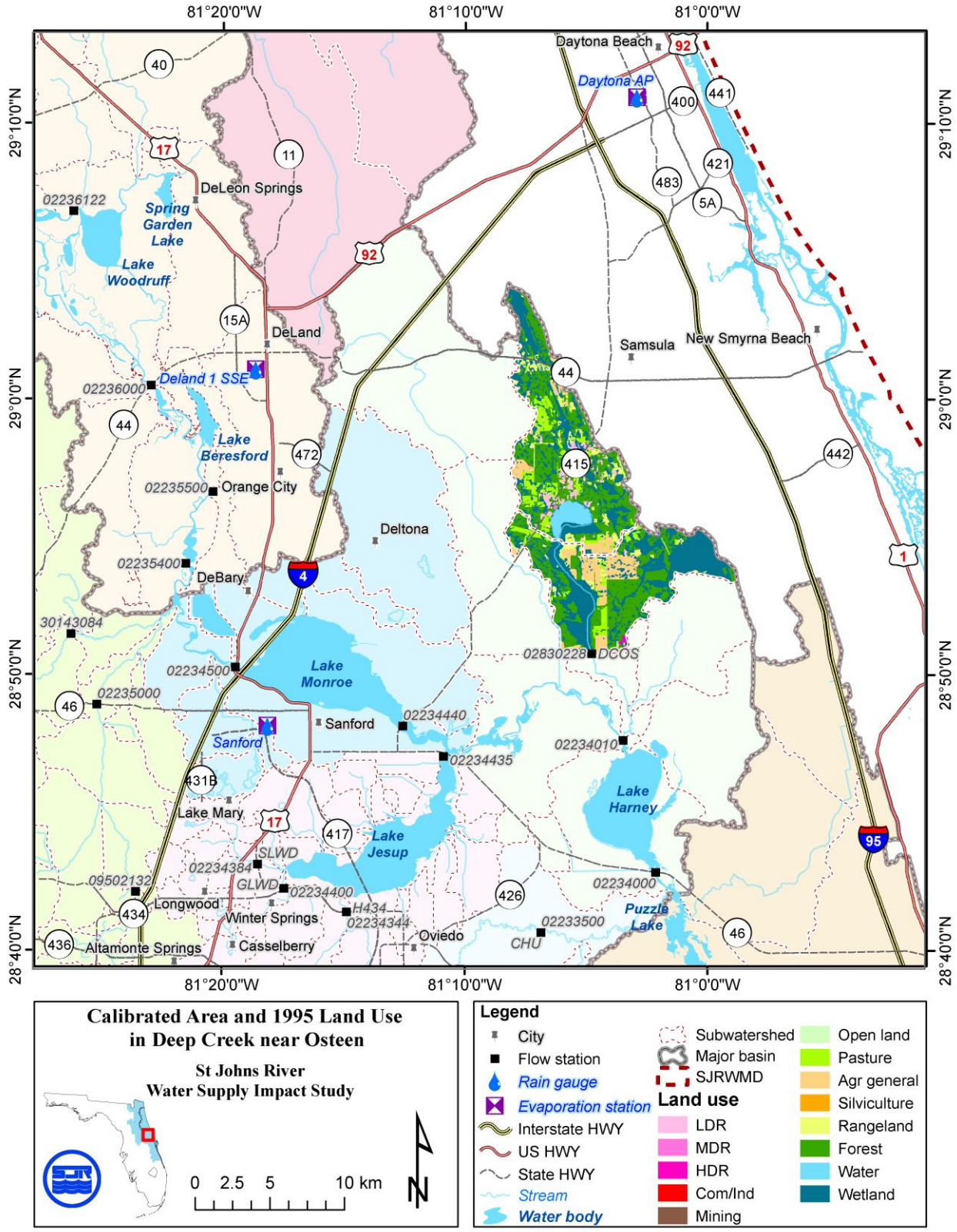

Figure 3.J.23: Deep Creek near Osteen land use map

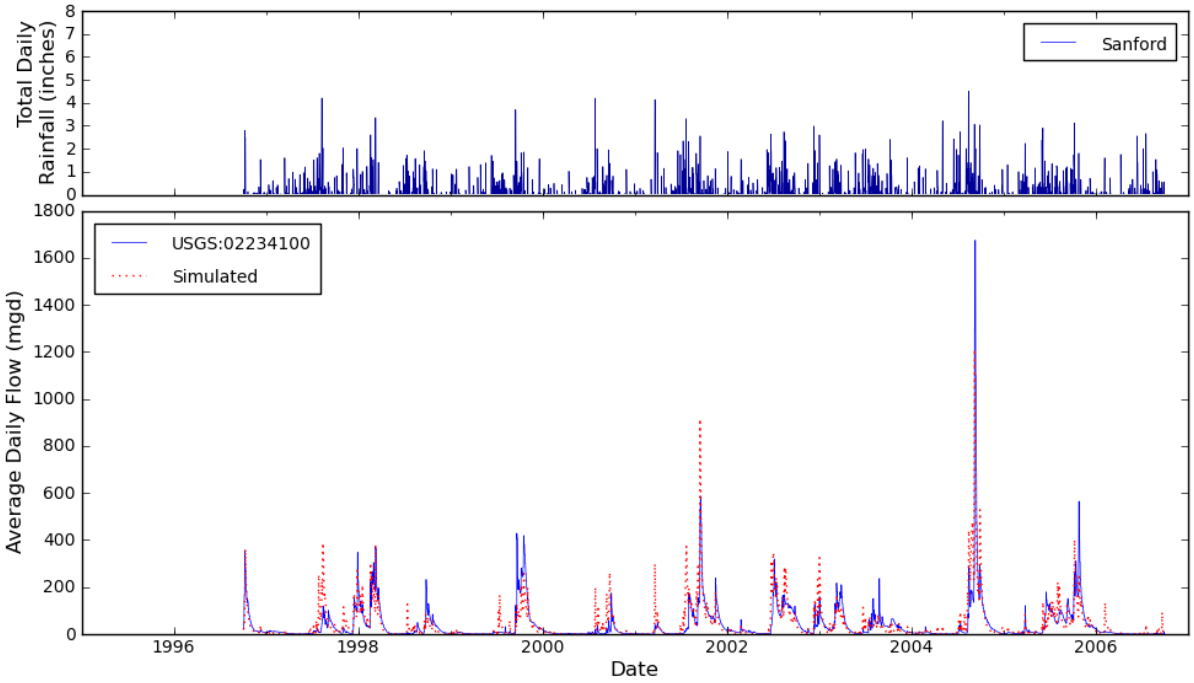

Figure 3.J.24: Deep Creek near Osteen daily hydrograph

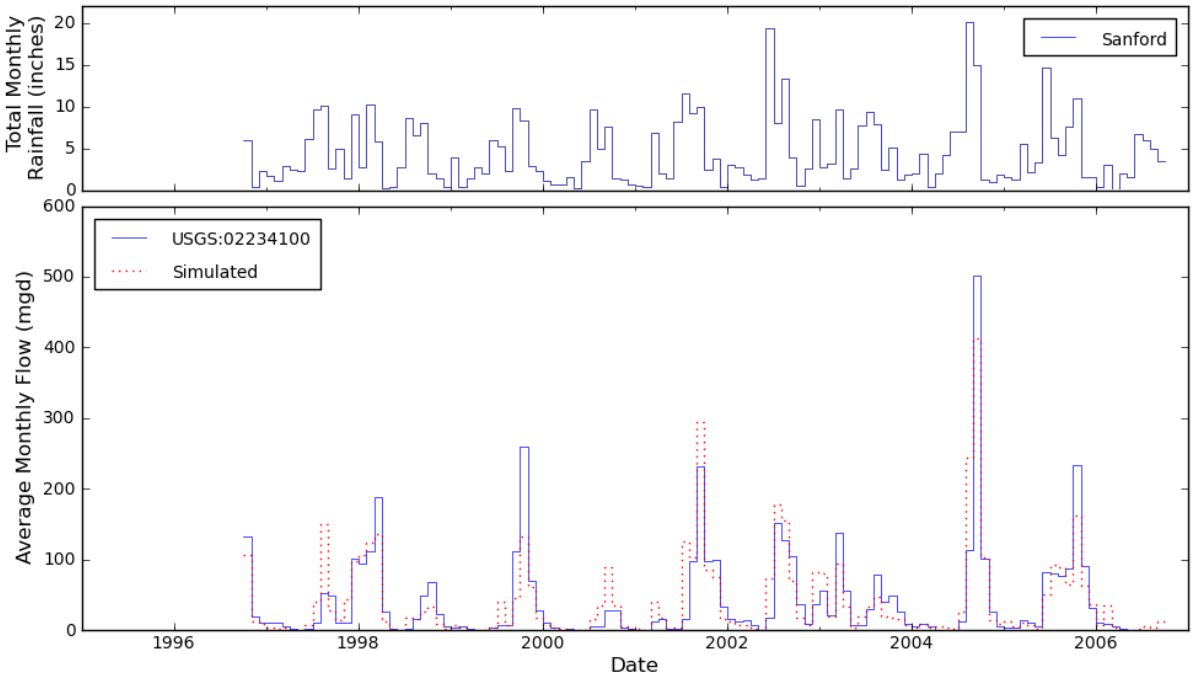

Figure 3.J.25: Deep Creek near Osteen monthly hydrograph

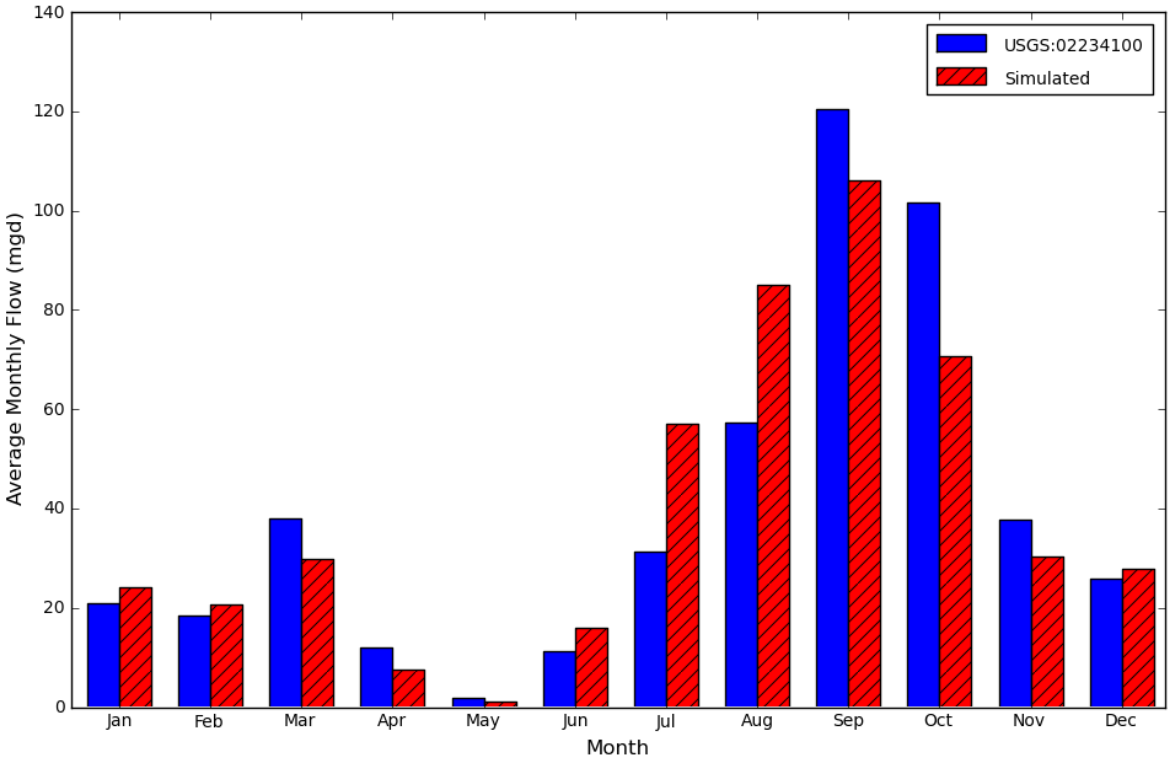

Figure 3.J.26: Deep Creek near Osteen average monthly flow

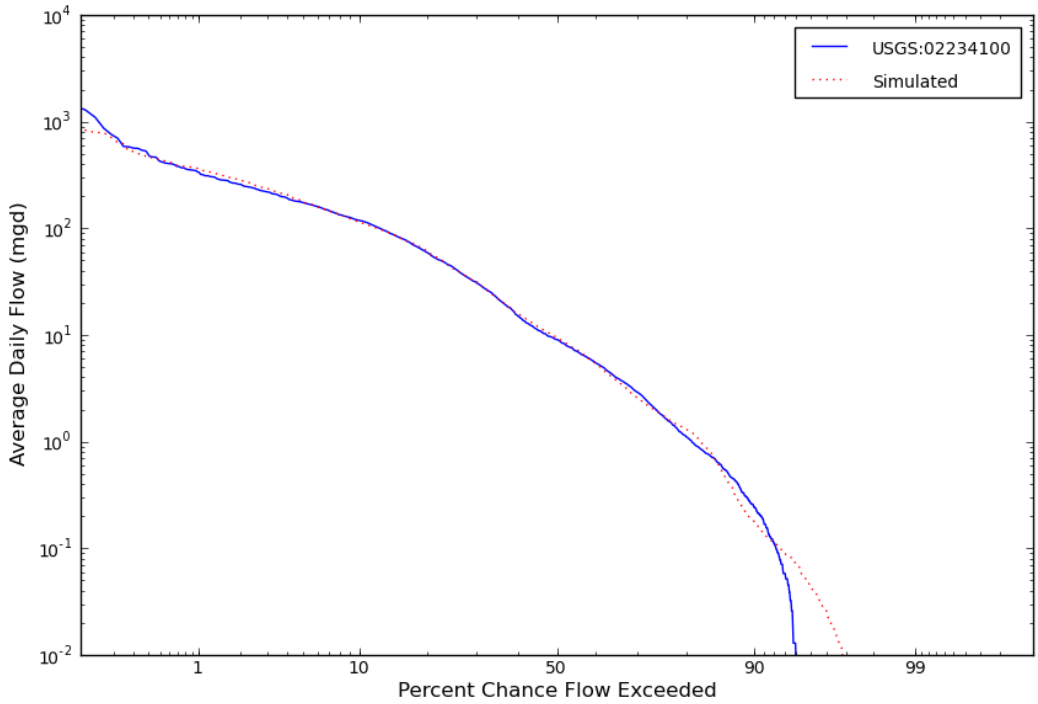

Figure 3.J.27: Deep Creek near Osteen exceedance probability curve

4C LAKE JESUP WATERSHED

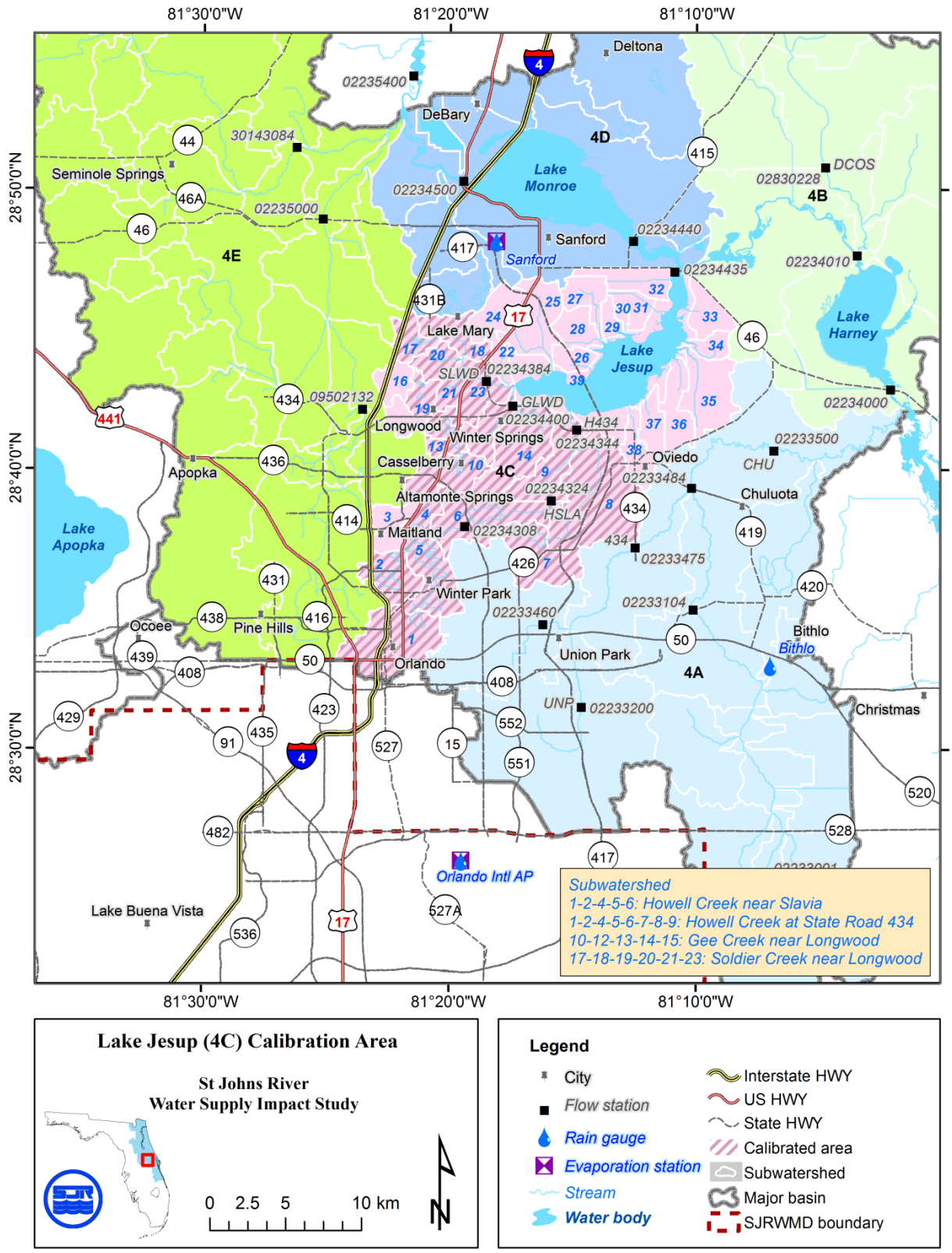

Figure 3.J.28: 4C Lake Jesup Watershed calibration areas

4C LAKE JESUP WATERSHED. HOWELL CREEK NEAR SLAVIA SUBWATERSHEDS

A variety of HSPF hydrologic parameters relating to watershed storage, infiltration, evaporation, and deep percolation are adjusted in the hydrologic calibration process to match the observed flows at four USGS flow stations: Howell Creek at SR434 near Oviedo (USGS 02234344), Howell Creek near Slavia (USGS 02234324), Gee Creek near Longwood (USGS 0223400), and Soldier Creek near Long wood (USGS 02234384). The extents of adjustment for these hydrologic parameters are generally within their reasonable ranges reported in USEPA (2000). One exception is the parameter controlling the fraction of groundwater inflow entering the deep groundwater (DEEPFR). High DEEPFR values, above the maximum value, 0.5, in the Common Logic guideline, are used for many high recharge areas in the Lake Jesup watershed, such as the upstream region of Howell Creek. In addition, the lakes in the high recharge areas are assumed to have significant leakage losses to groundwater aquifers. The recharge loss from a lake is implemented in the HSPF model by adding an additional exit from the lake RCHRES in its FTABLE. The outflow from this exit is lost from the watershed system defined in the HSPF model. The DEEPFR values and the leakage rates are initially estimated based on the recharge rates from SJRWMD's recharge map developed by Don Boniol and then calibrated to match the observed flows at the downstream gauges.

Many subwatersheds, especially those near Lake Jesup, have both discharge and recharge areas. In general, it is assumed that the discharges cancel out the recharges, and thus, the discharges are not simulated in these subwatersheds. However, a constant groundwater discharge to the downstream region of Howell Creek is simulated in the HSPF model. This discharge is implemented in the HSPF model as a time series input to the RCHRES segment in the subwatershed 9 of the Lake Jesup watershed. The discharge rate is determined in the calibration process to make sure that simulated flows match the observed flows at the downstream gauge Howell Creek at SR434 near Oviedo (USGS 02234344).

The daily hydrograph in the following subsection compare the simulated flows and the observed flows at the four calibration sites over the calibration period 10/1995 – 09/2006. It can be seen that good agreement is achieved between the simulated flows and the observed flows. The statistical measures evaluating the fitness between simulated and observed flows are provided in the calibration statistics tables in the following subsection. During the process of hydrologic calibration, the daily flow-frequency duration curves and the correlation of simulated and observed daily flows are evaluated. In addition, simulated and observed stages are compared at the calibration sites. Furthermore, the comparison of simulated and observed flows is performed for monthly values. The plots for some of these comparisons are provided in the following subsection. Based on the results of hydrologic calibration, it is concluded that the HSPF model adequately represents the hydrologic processes of the watershed.

Table 3.J.11: Calibration Model Performance

Nash-Sutcliffe (Monthly Mean Flow)	Percent Error of the Mean
0.70	1.31

Table 3.J.12: Descriptive Calibration Statistics

Statistic (Daily Flow (mgd))	Observed (USGS:02234324)	Simulated
Average	19.45	19.71
Median	9.05	11.08
Variance	839.15	690.43
Standard Deviation	28.97	26.28
Skew	3.64	3.05
Kurtosis	20.22	13.24
Minimum	0.43	0.43
Maximum	326.39	243.71
Range	325.96	243.28

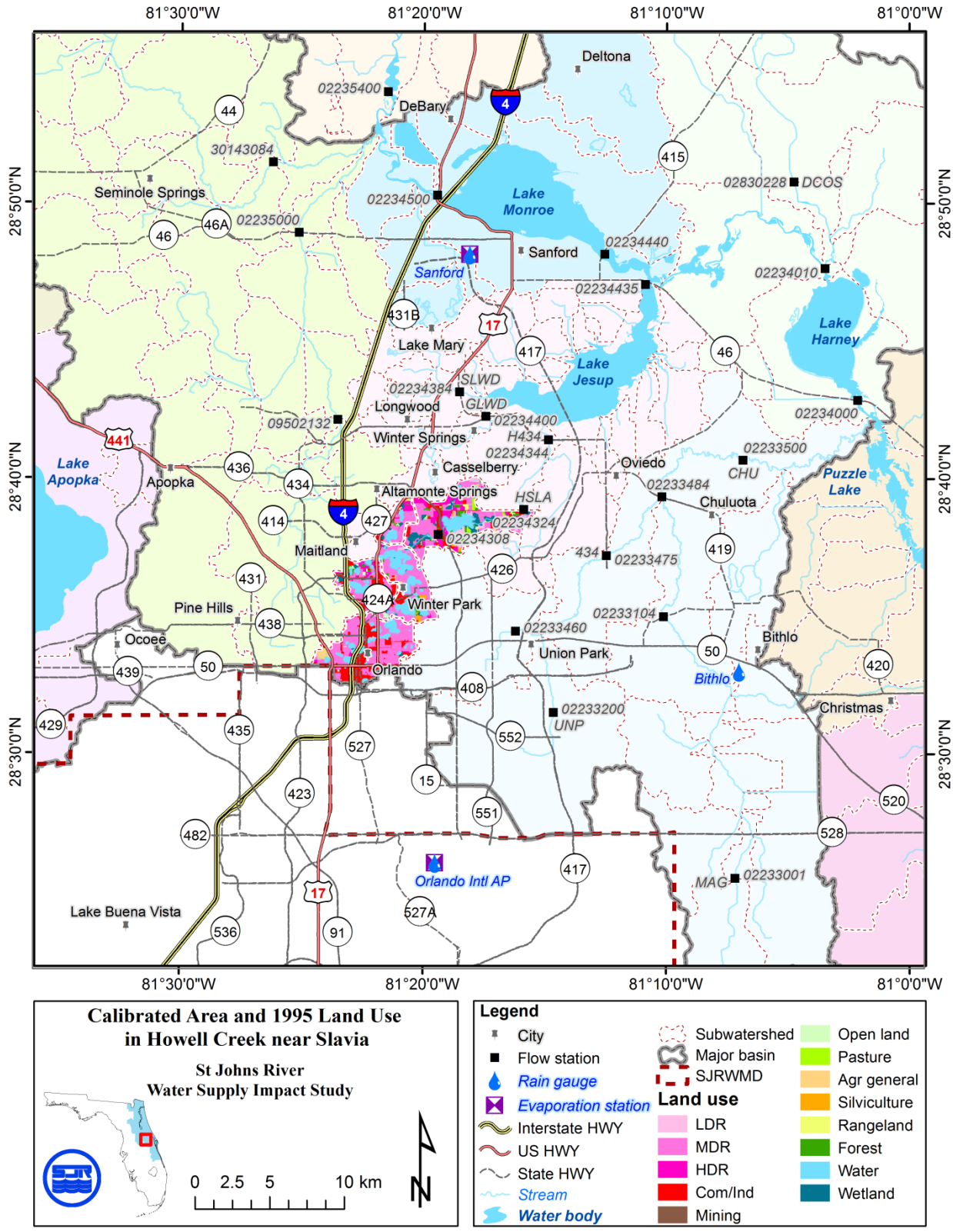

Figure 3.J.29: Howell Creek near Slavia land use map

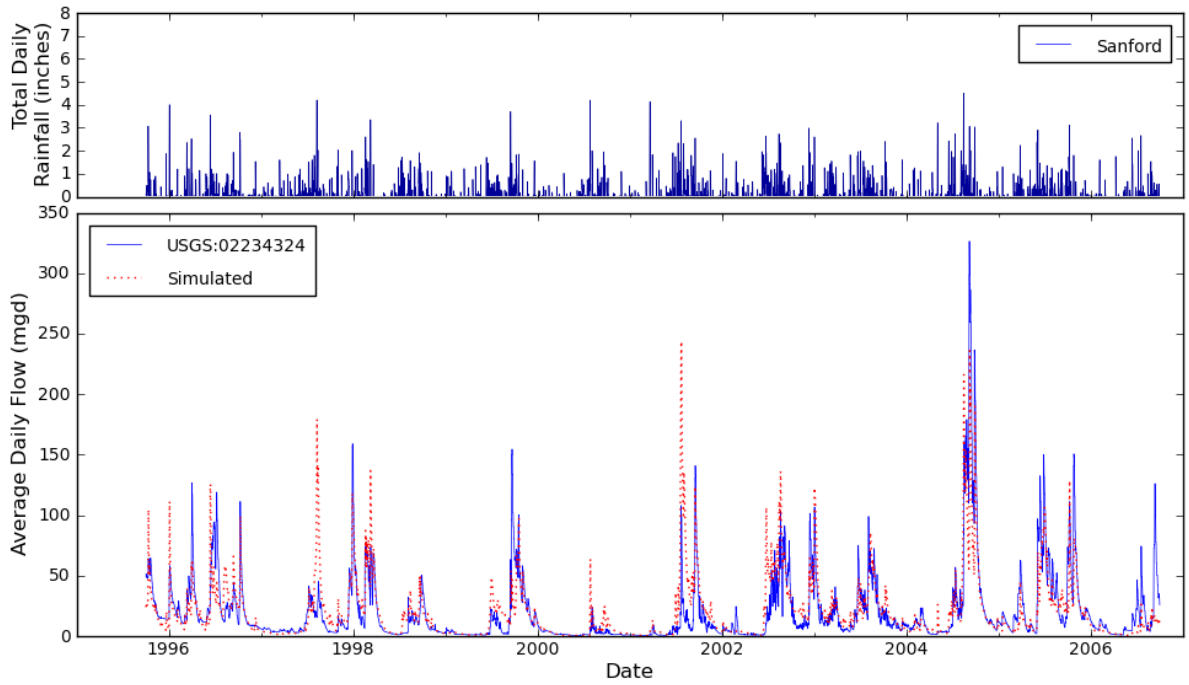

Figure 3.J.30: Howell Creek near Slavia daily hydrograph

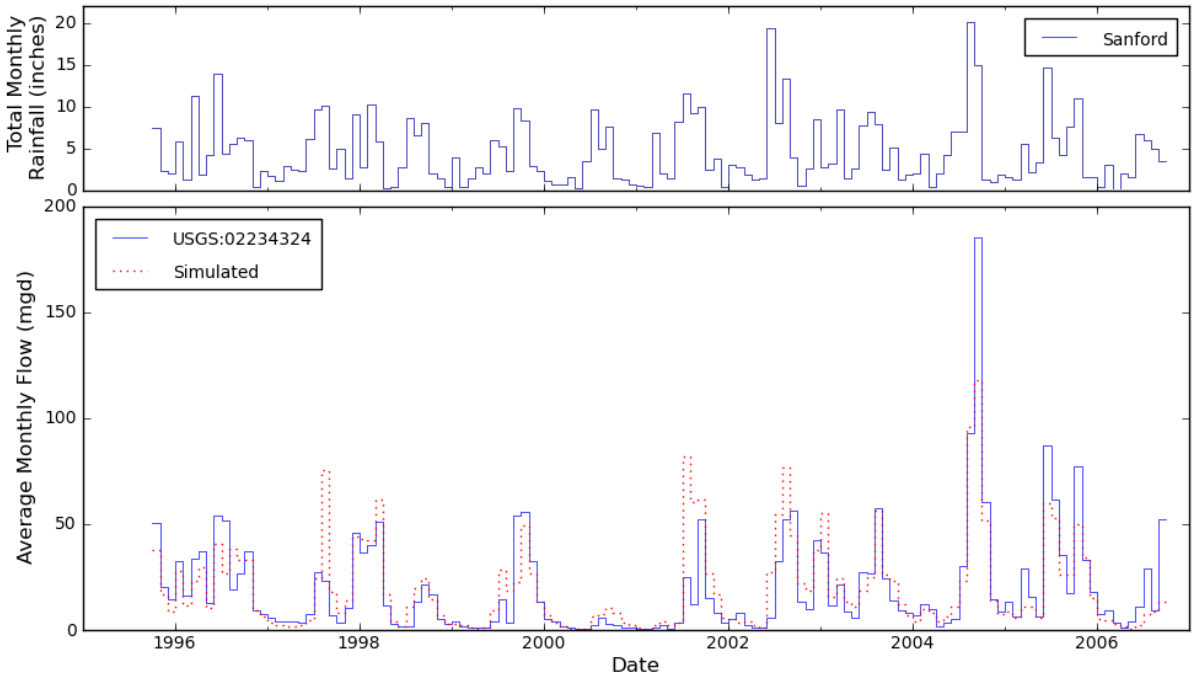

Figure 3.J.31: Howell Creek near Slavia monthly hydrograph

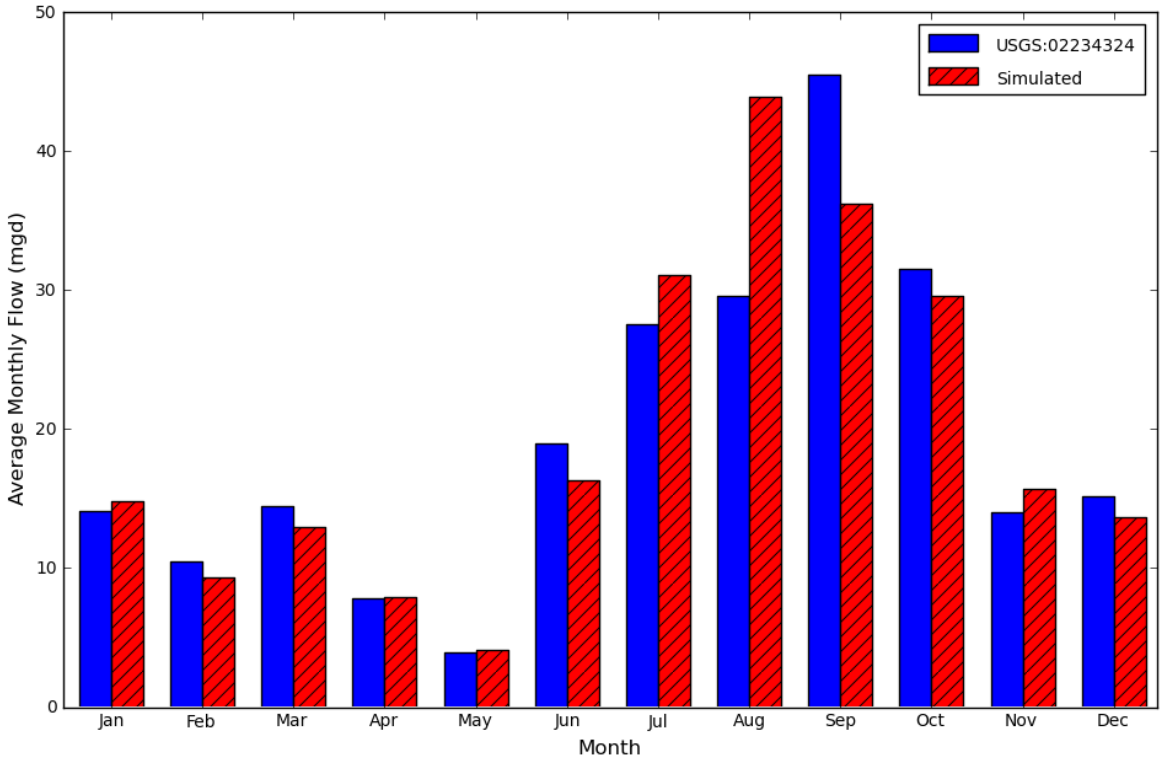

Figure 3.J.32: Howell Creek near Slavia average monthly flow

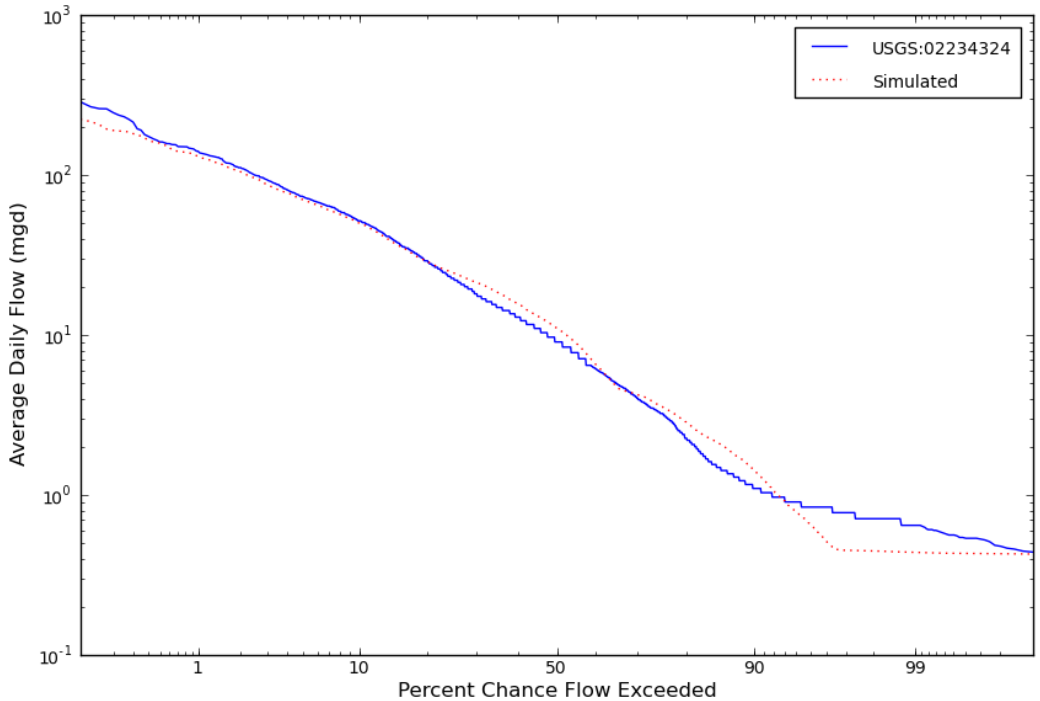

Figure 3.J.33: Howell Creek near Slavia exceedance probability curve

4C LAKE JESUP WATERSHED. HOWELL CREEK AT STATE ROAD 434 SUBWATERSHEDS

Please refer to discussion in appendix describing "4C Lake Jesup Watershed: Howell Creek near Slavia Subwatersheds"

Table 3.J.13: Calibration Model Performance

Nash-Sutcliffe (Monthly Mean Flow)	Percent Error of the Mean
0.73	-0.74

Table 3.J.14: Descriptive Calibration Statistics

Statistic (Daily Flow (mgd))	Observed (USGS:02234344)	Simulated
Average	46.49	46.15
Median	25.21	25.75
Variance	3879.40	3939.16
Standard Deviation	62.28	62.76
Skew	3.35	4.10
Kurtosis	14.82	24.86
Minimum	2.00	3.14
Maximum	567.47	681.49
Range	565.46	678.35

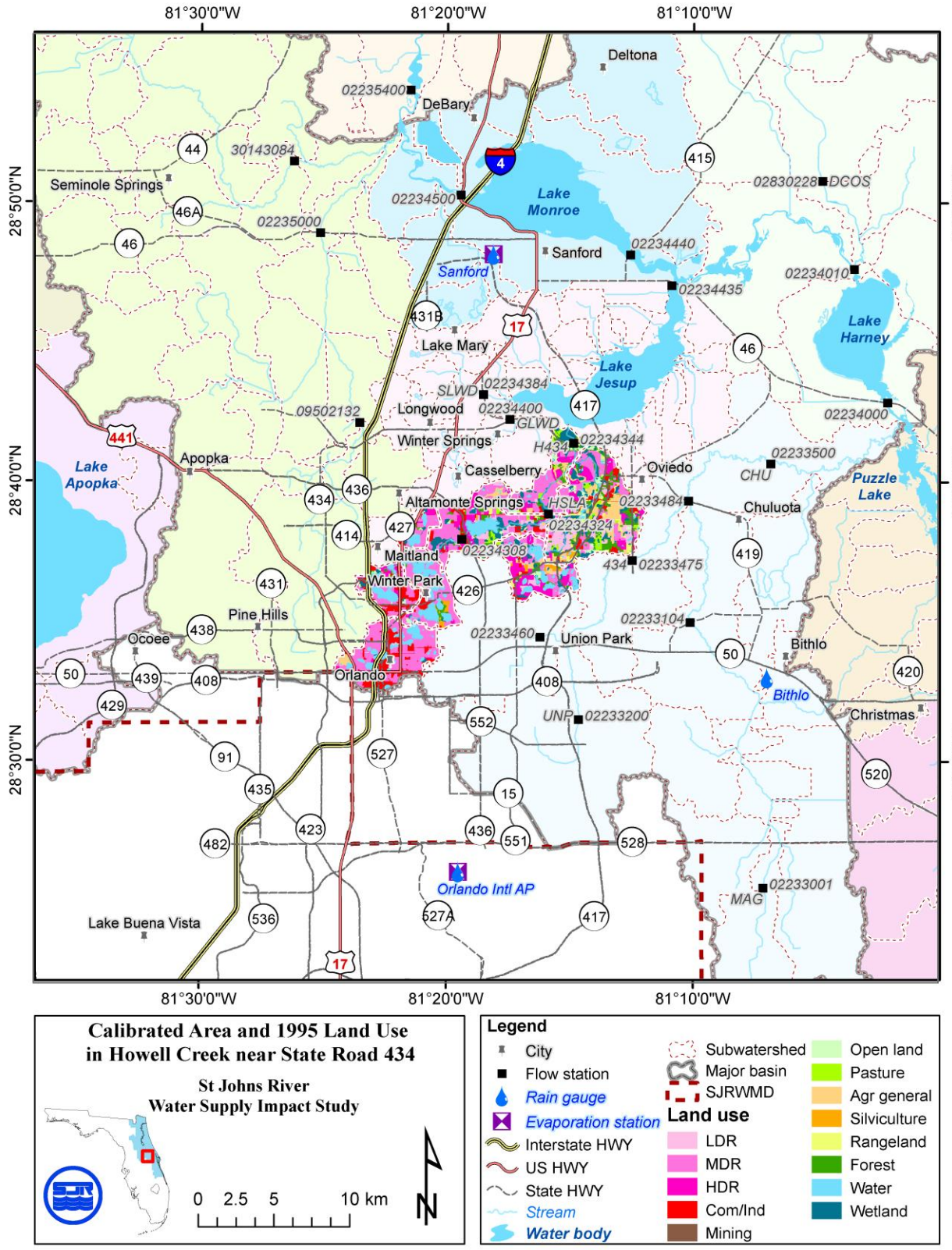

Figure 3.J.34: Howell Creek at State Road 434 land use map

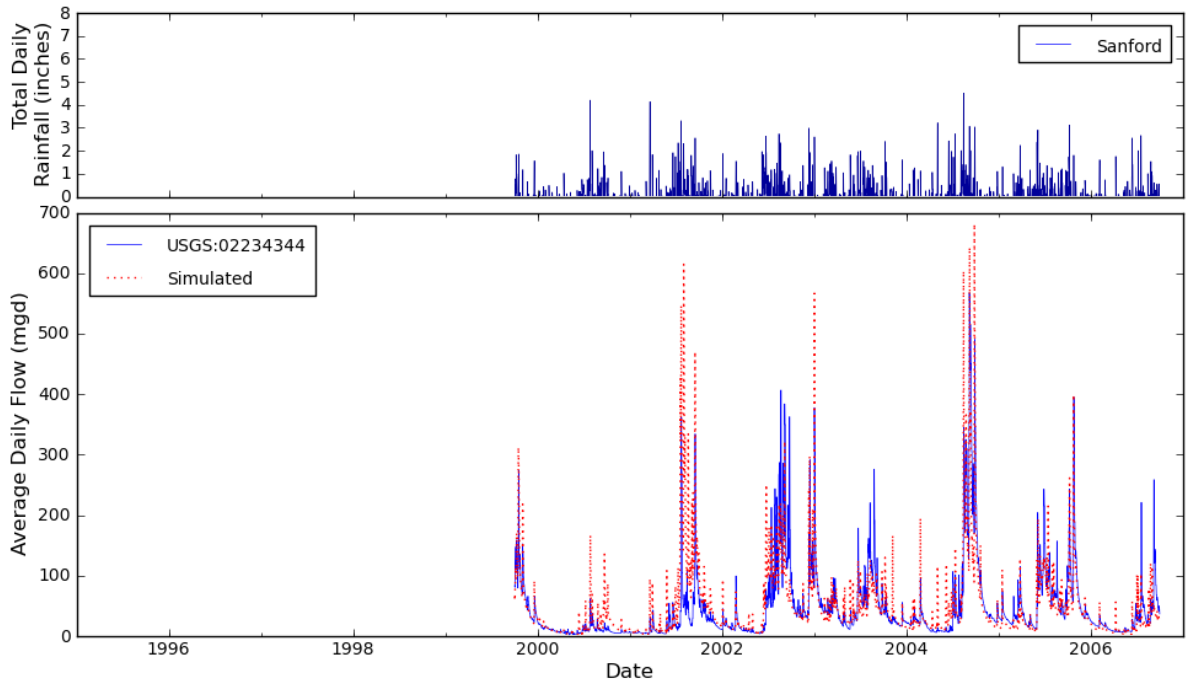

Figure 3.J.35: Howell Creek at State Road 434 daily hydrograph

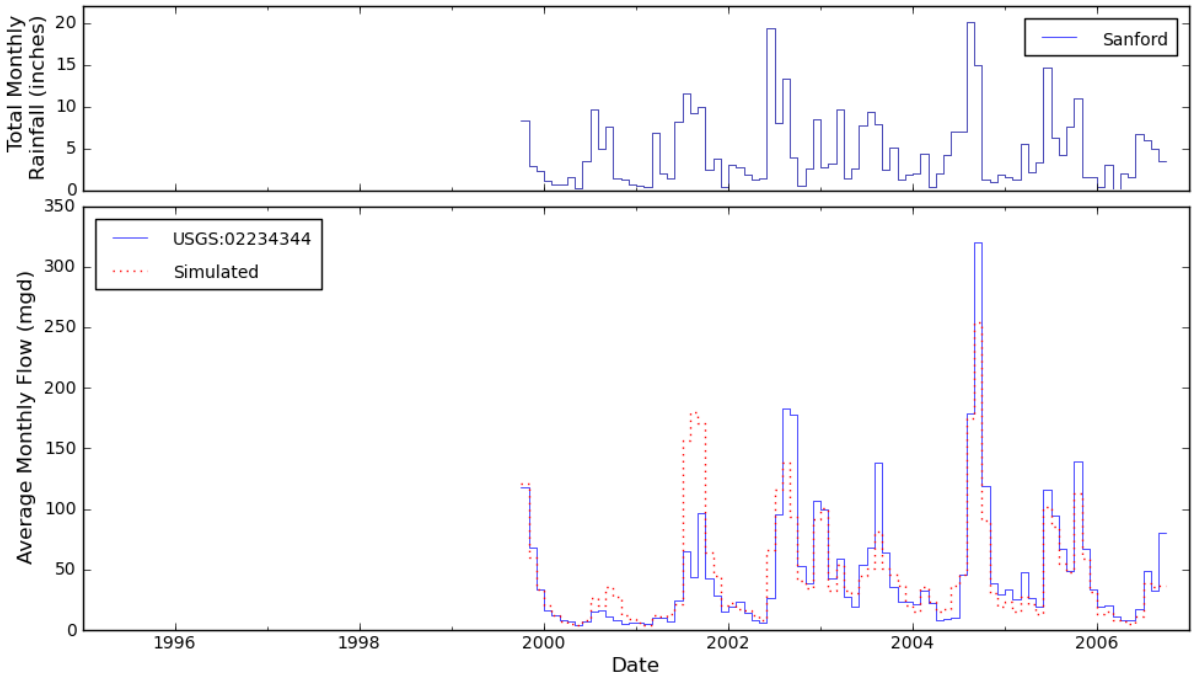

Figure 3.J.36: Howell Creek at State Road 434 monthly hydrograph

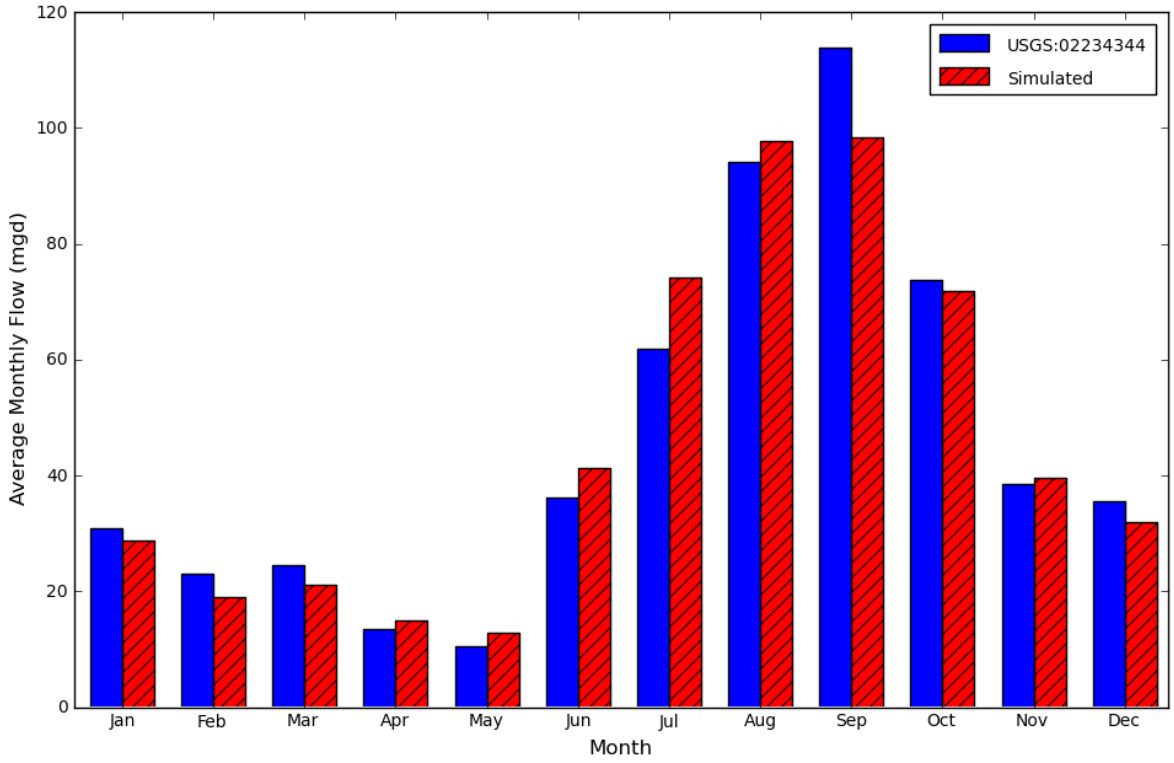

Figure 3.J.37: Howell Creek at State Road 434 average monthly flow

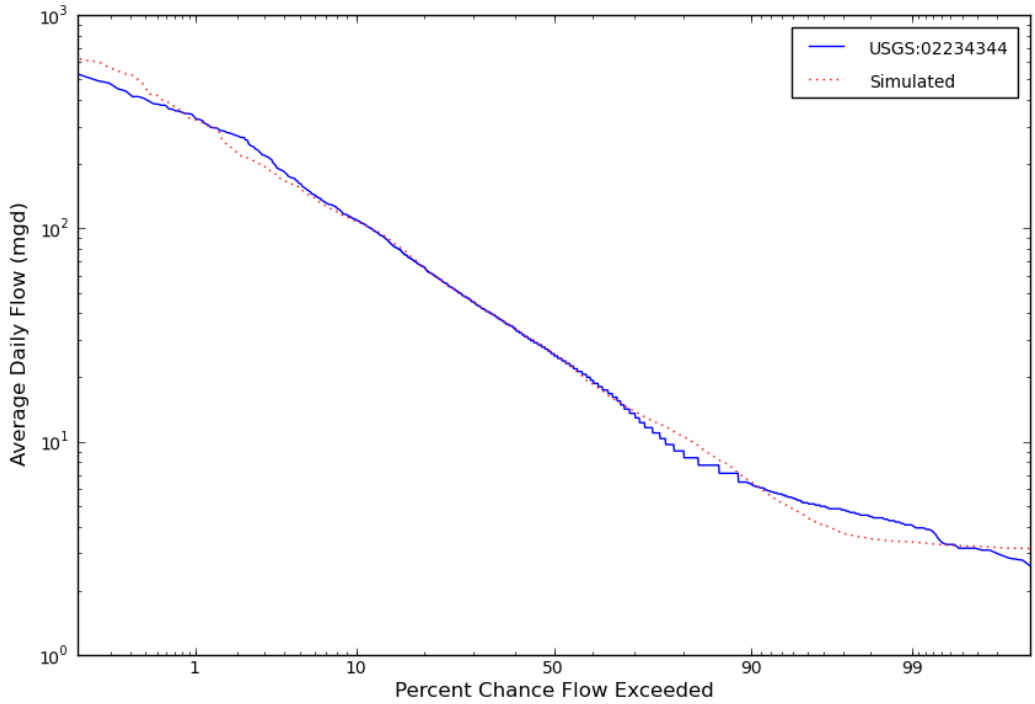

Figure 3.J.38: Howell Creek at State Road 434 exceedance probability curve

4C LAKE JESUP WATERSHED. GEE CREEK NEAR LONGWOOD SUBWATERSHEDS

Please refer to discussion in appendix describing "4C Lake Jesup Watershed: Howell Creek near Slavia Subwatersheds"

Table 3.J.15: Calibration Model Performance

Nash-Sutcliffe (Monthly Mean Flow)	Percent Error of the Mean
0.60	0.77

Table 3.J.16: Descriptive Calibration Statistics

Statistic (Daily Flow (mgd))	Observed (USGS:02234400)	Simulated
Average	10.78	10.87
Median	4.65	4.72
Variance	284.64	289.20
Standard Deviation	16.87	17.01
Skew	3.54	3.84
Kurtosis	16.28	21.39
Minimum	0.00	0.07
Maximum	169.34	195.76
Range	169.34	195.69

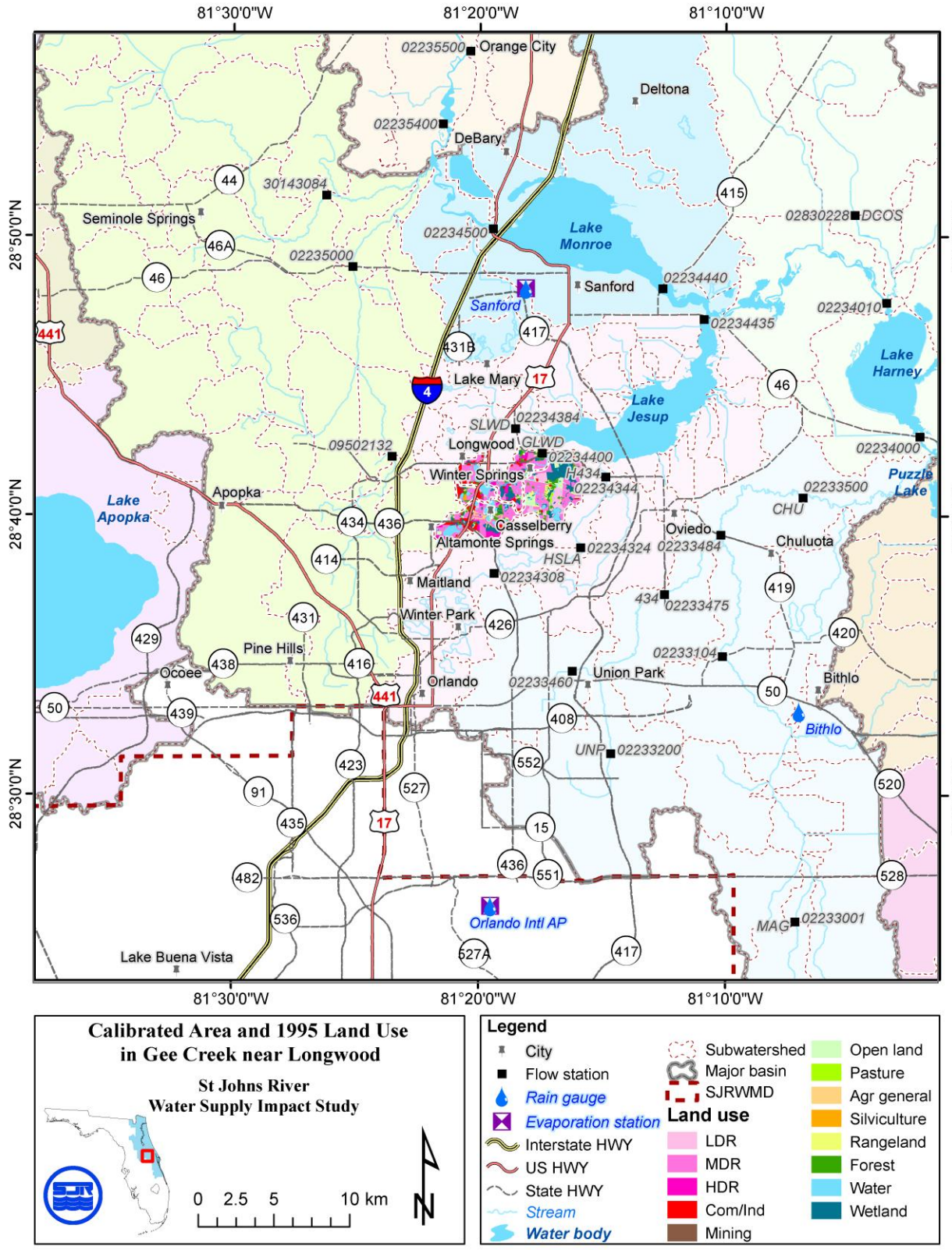

Figure 3.J.39: Gee Creek near Longwood land use map

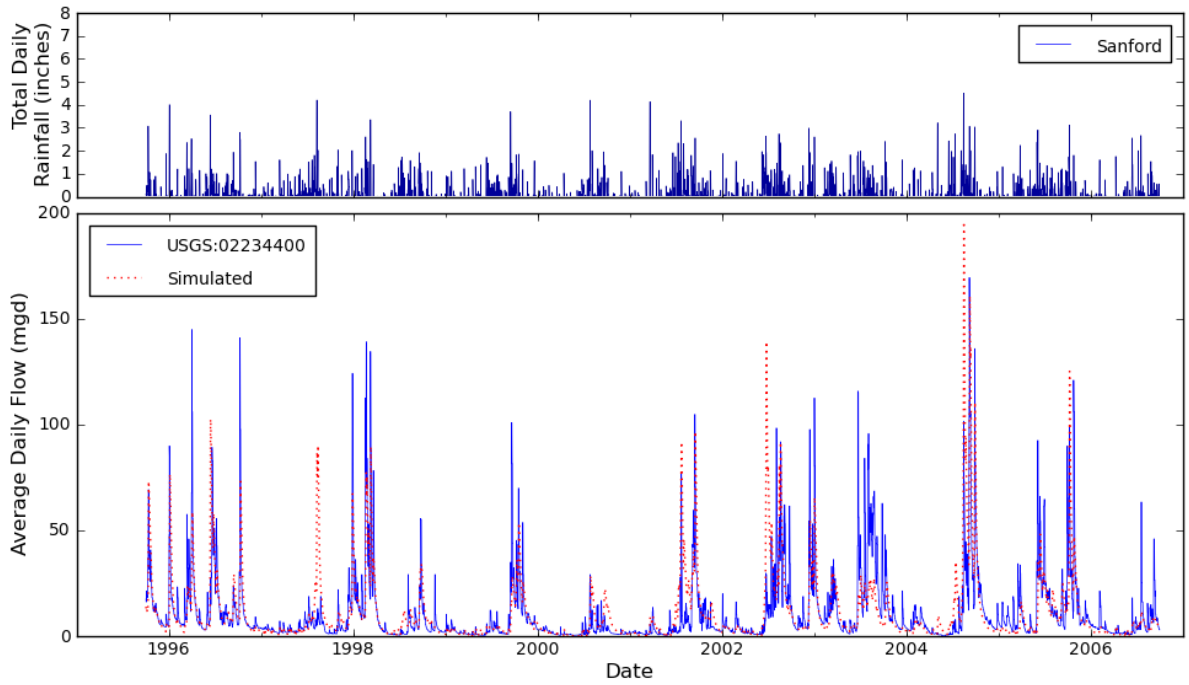

Figure 3.J.40: Gee Creek near Longwood daily hydrograph

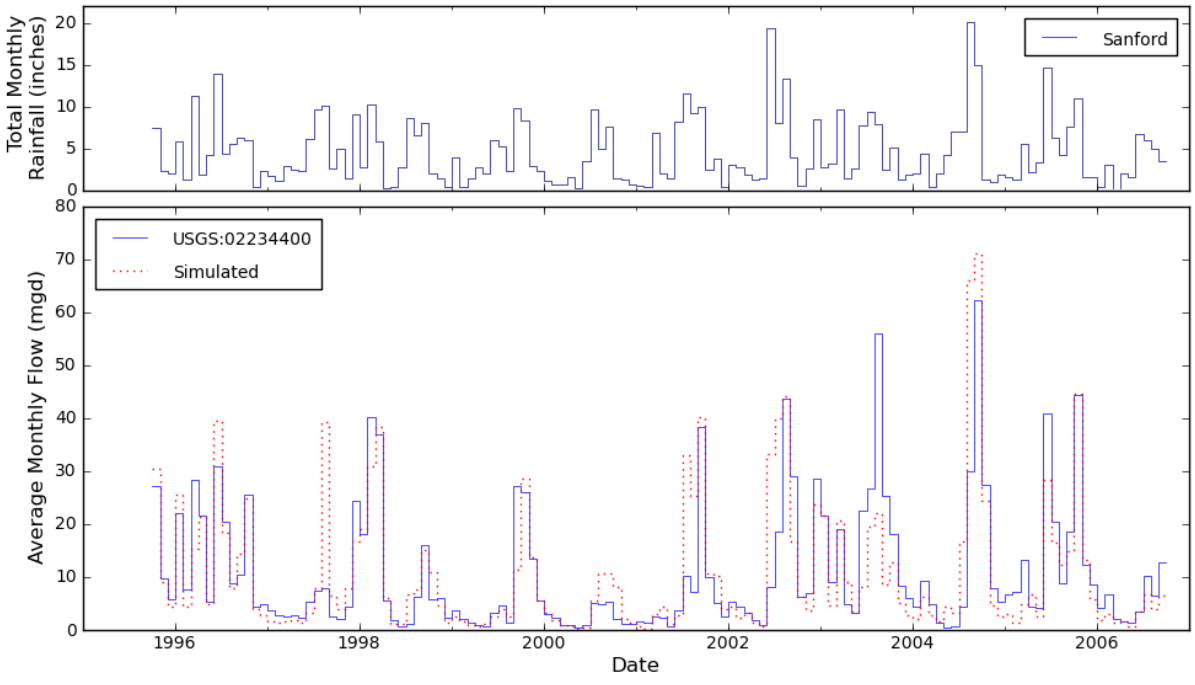

Figure 3.J.41: Gee Creek near Longwood monthly hydrograph

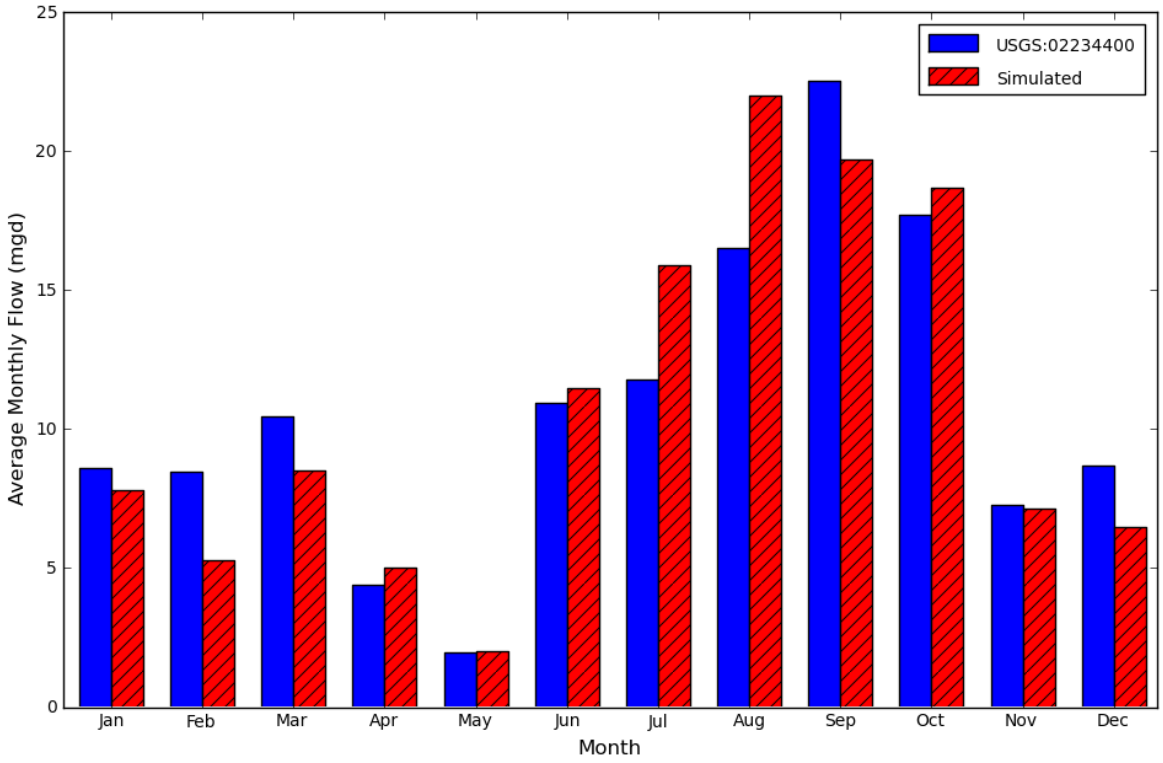

Figure 3.J.42: Gee Creek near Longwood average monthly flow

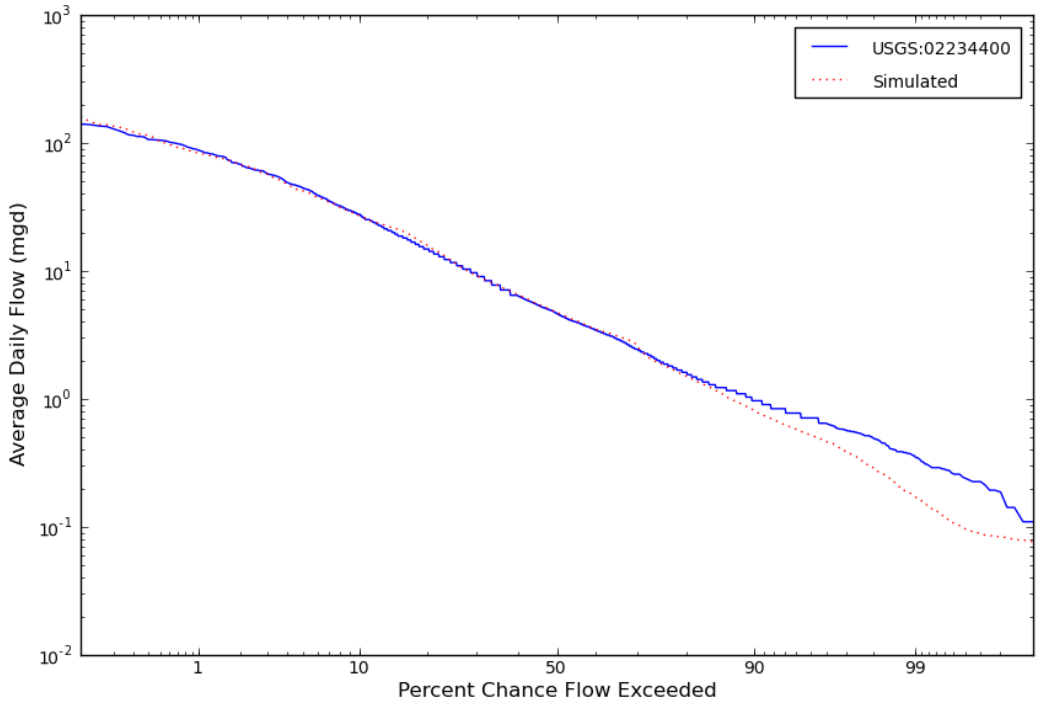

Figure 3.J.43: Gee Creek near Longwood exceedance probability curve

4C LAKE JESUP WATERSHED. SOLDIER CREEK NEAR LONGWOOD SUBWATERSHEDS

Please refer to discussion in appendix describing "4C Lake Jesup Watershed: Howell Creek near Slavia Subwatersheds"

Table 3.J.17: Calibration Model Performance

Nash-Sutcliffe (Monthly Mean Flow)	Percent Error of the Mean
0.64	-0.39

Table 3.J.18: Descriptive Calibration Statistics

Statistic (Daily Flow (mgd))	Observed (USGS:02234384)	Simulated
Average	8.69	8.66
Median	3.68	3.83
Variance	190.15	164.42
Standard Deviation	13.79	12.82
Skew	4.38	3.44
Kurtosis	29.95	16.97
Minimum	0.07	0.05
Maximum	172.57	128.93
Range	172.50	128.88

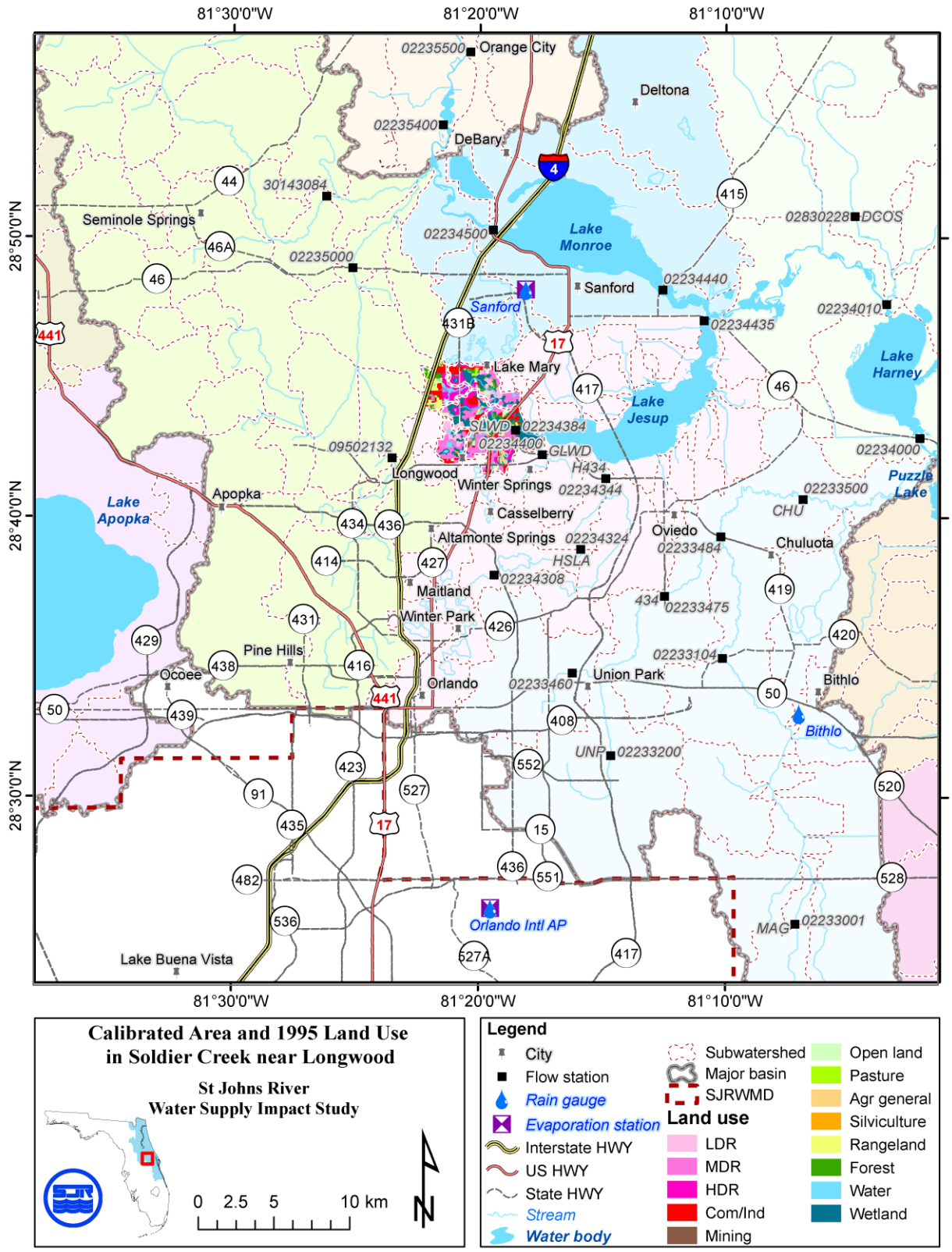

Figure 3.J.44: Soldier Creek near Longwood land use map

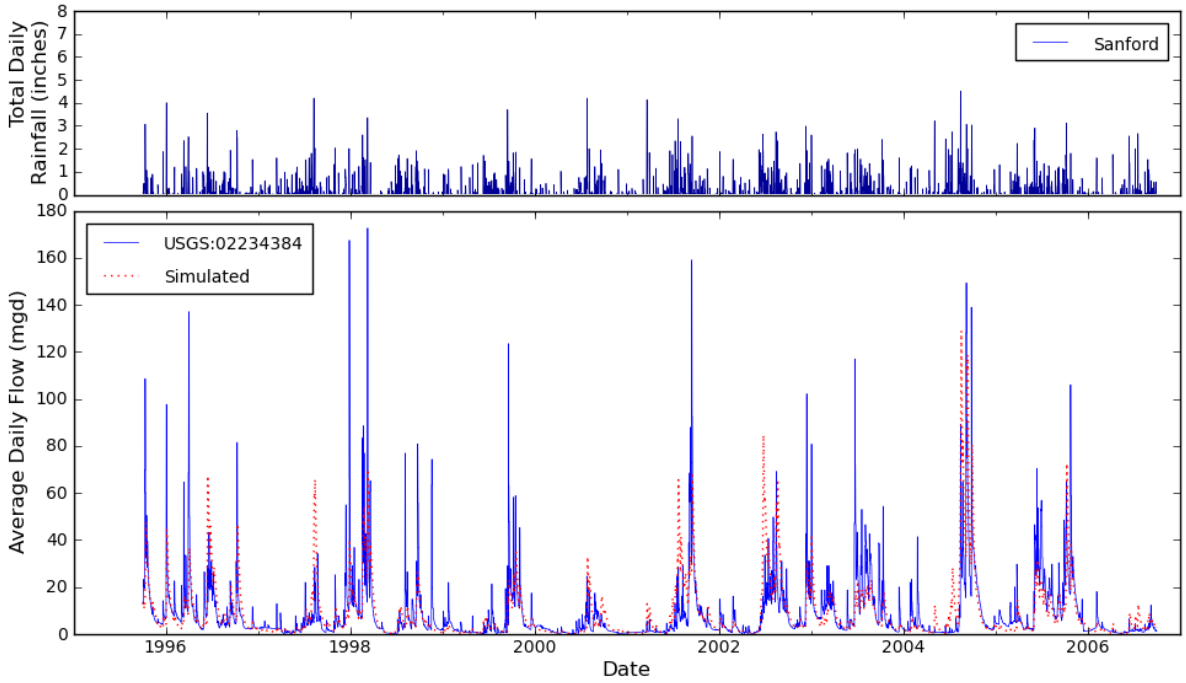

Figure 3.J.45: Soldier Creek near Longwood daily hydrograph

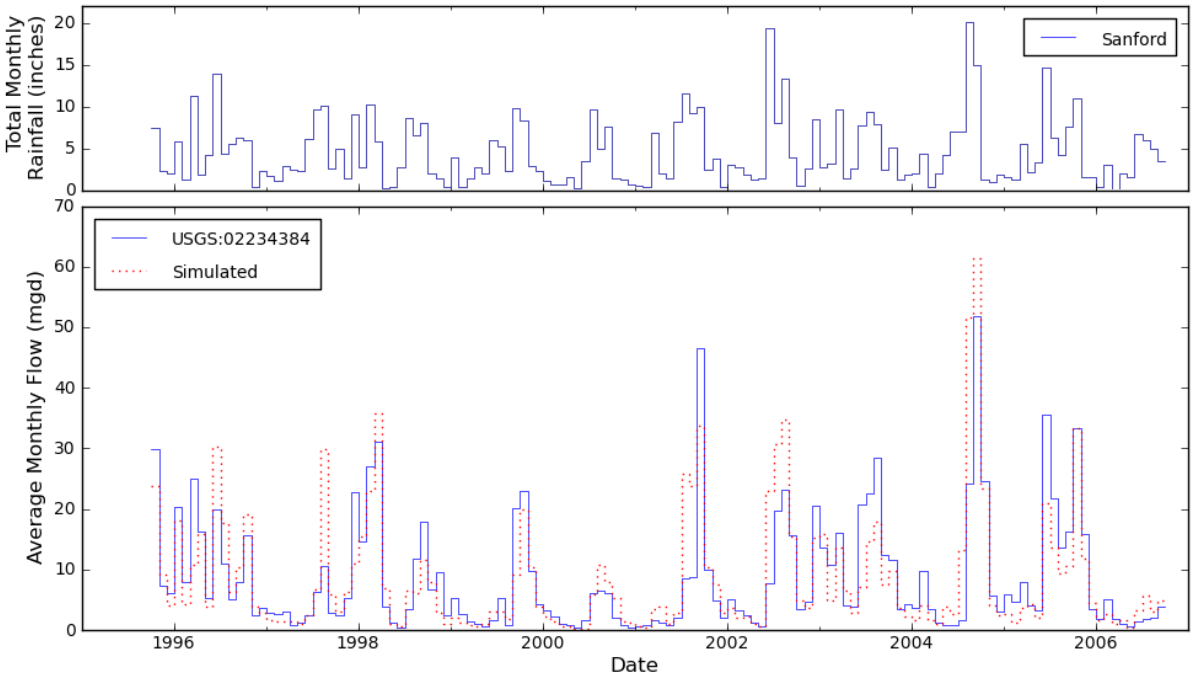

Figure 3.J.46: Soldier Creek near Longwood monthly hydrograph

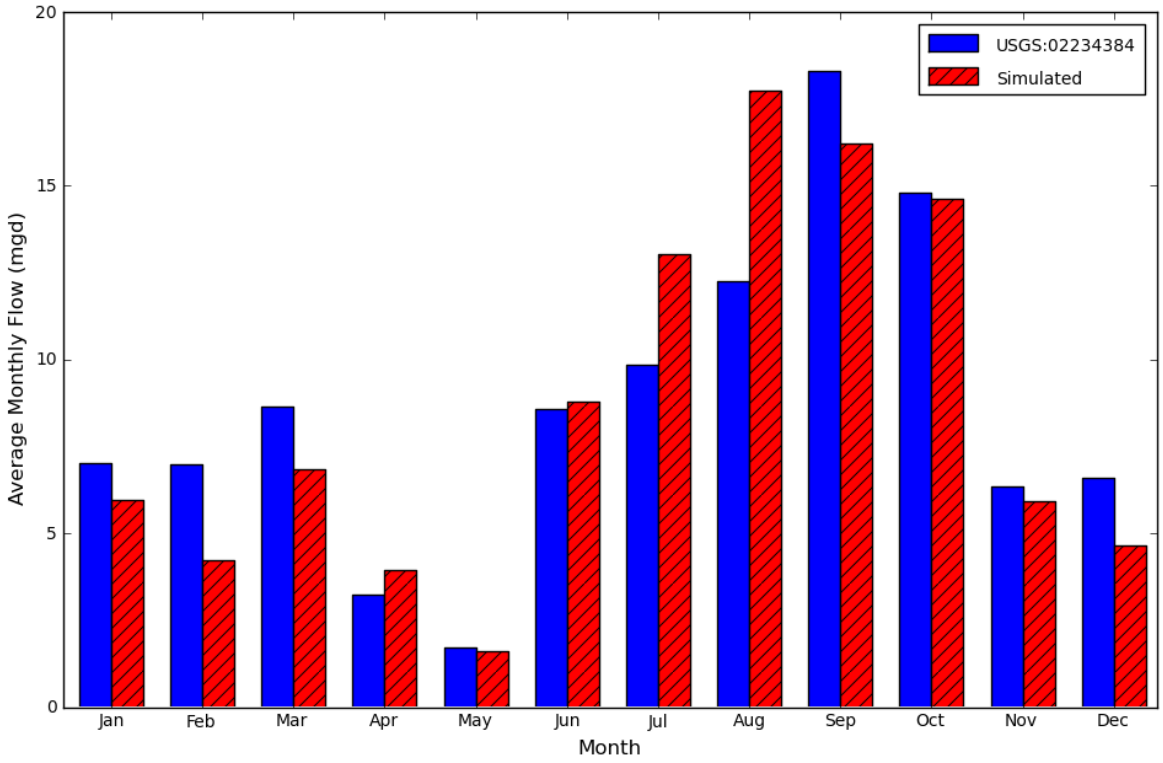

Figure 3.J.47: Soldier Creek near Longwood average monthly flow

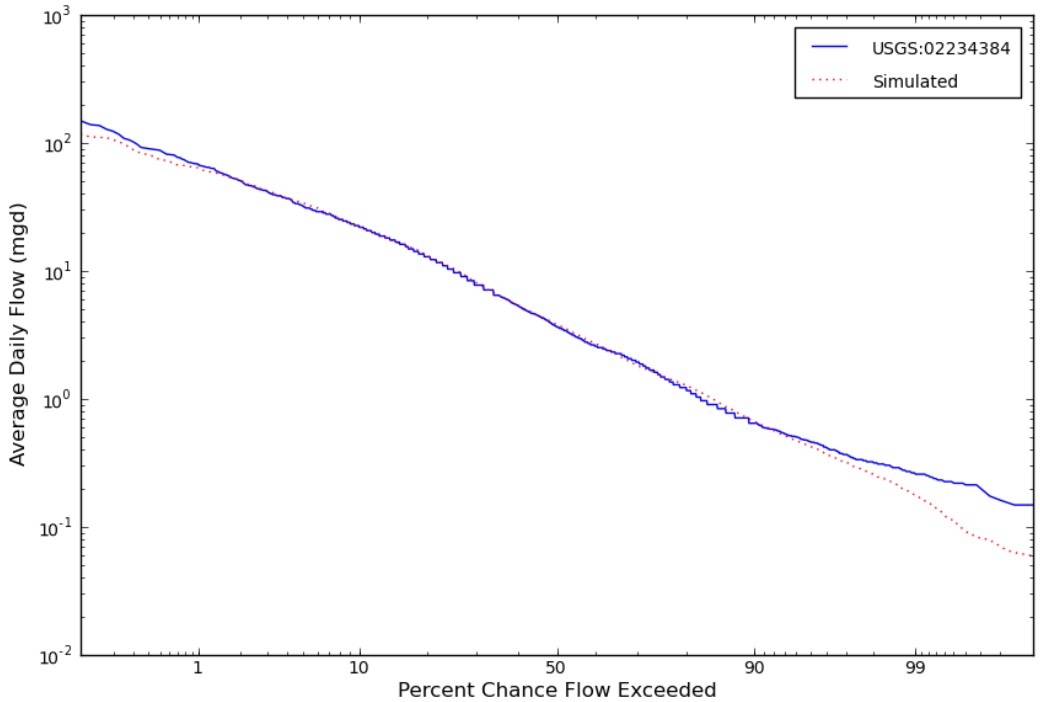

Figure 3.J.48: Soldier Creek near Longwood exceedance probability curve

4E WEKIVA RIVER WATERSHED

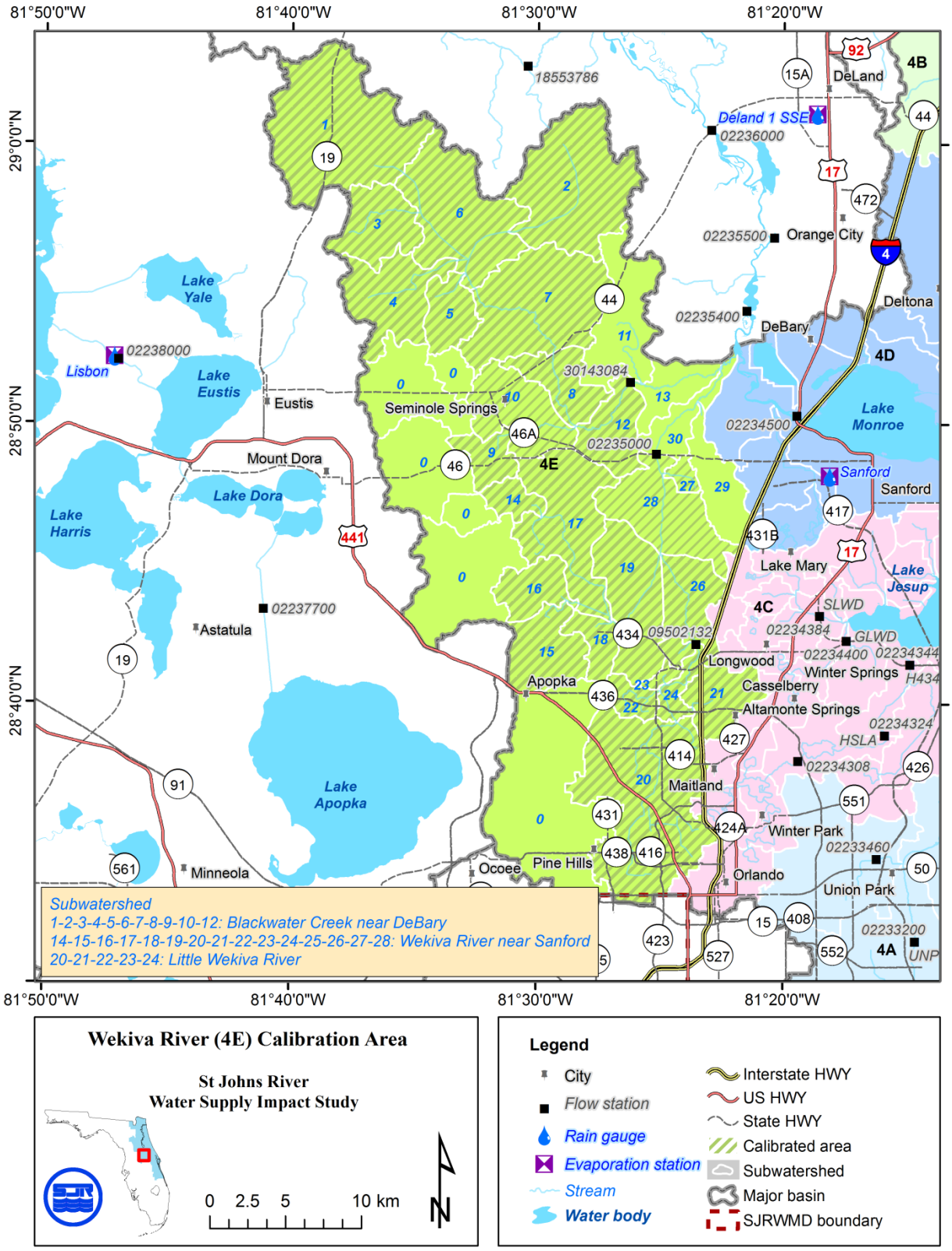

Figure 3.J.49: 4E Wekiva River Watershed calibration areas

4E WEKIVA RIVER WATERSHED. BLACK WATER CREEK NEAR DEBARY SUBWATERSHEDS

The Wekiva River System can be described as consisting of Wekiva River, Little Wekiva River, and Black Water Creek. Gages within the river and two tributaries are selected for comparison to simulated discharge and model parameter adjustment. Long-term daily flow data have been monitored by USGS and SJRWMD. SJRWMD gage 30143084, Black Water Creek near Debary is used to compare to simulated flow and adjust model parameters. The gage is located about 5.2 miles upstream from the confluence with the Wekiva River. The gage began recording in October 1990. The calibration period is from 1/1/1995 to 12/31/2006.

Model development initially consist of reviewing and adopting parameters from the adjacent Alexander Springs watershed model. Inflow was added from Messant and Seminole springs at appropriate locations along the Black Water Creek (see the table of spring flow in the description of Wekiva River Basin section). The record for both Messant and Seminole springs did not extend over the period of simulation. To extend the spring flow timeseries at these two locations measured spring flow was correlated to the Floridan Aquifer potentiometric level recorded at USGS gage 284147081220201, Seminole 125 well at Longwood. The gage has been recording daily potentiometric level from November 1952 to current. With runoff characteristics established and spring flow input assigned, PEST is applied to adjust HSPF model parameters according to general project guidelines and model parameter ranges to achieve a satisfactory match between simulated and gauged discharge. Parameter adjustments are applied to the model section corresponding to the Black Water Creek portion of the model.

Calibration results at the Black Water Creek gage location are overall very good. The Nash-Sutcliffe efficiency coefficient is 0.80 and the percent error of the mean flow is -1.35. Comparison of simulated to gauged daily flow at SJRWMD gage 30143084 indicates the overall trend of the hydrograph is matched, although large peak flow events are underestimated. The wet winter of 1998 is reproduced. Low flow conditions are matched in the first half of 1997 and throughout 2006. Low flow tends to be about 50 to 70 cfs; about 45 to 55 cfs is spring flow input. Comparison of average monthly flow shows that the seasonal trends are generally represented. However, early months of the year (January to April) tend to be underestimated. The discharge duration curves are close over the majority of the range. The exception is in the high flow range. At less than 1 percent chance exceeded, flows greater of 400 mgd and greater tend to be underestimated.

Table 3.J.19: Calibration Model Performance

Nash-Sutcliffe (Monthly Mean Flow)	Percent Error of the Mean
0.80	-1.35

Table 3.J.20: Descriptive Calibration Statistics

Statistic (Daily Flow (mgd))	Observed (SJRWMD:30143084)	Simulated
Average	97.90	96.58
Median	73.94	80.70
Variance	5231.40	3479.66
Standard Deviation	72.33	58.99
Skew	3.02	2.10
Kurtosis	15.02	7.03
Minimum	31.02	31.52
Maximum	789.48	512.23
Range	758.45	480.71

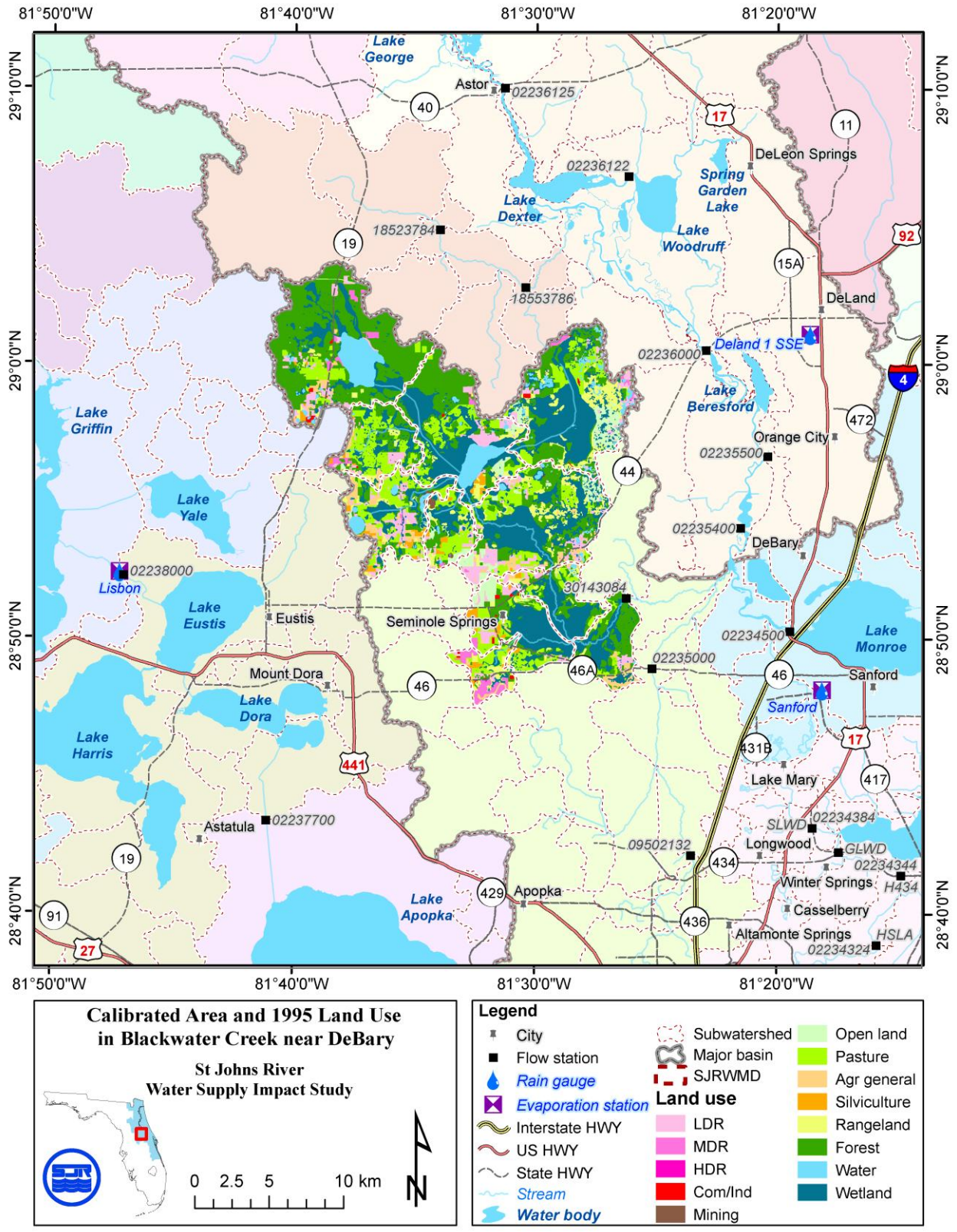

Figure 3.J.50: Black Water Creek near DeBary land use map

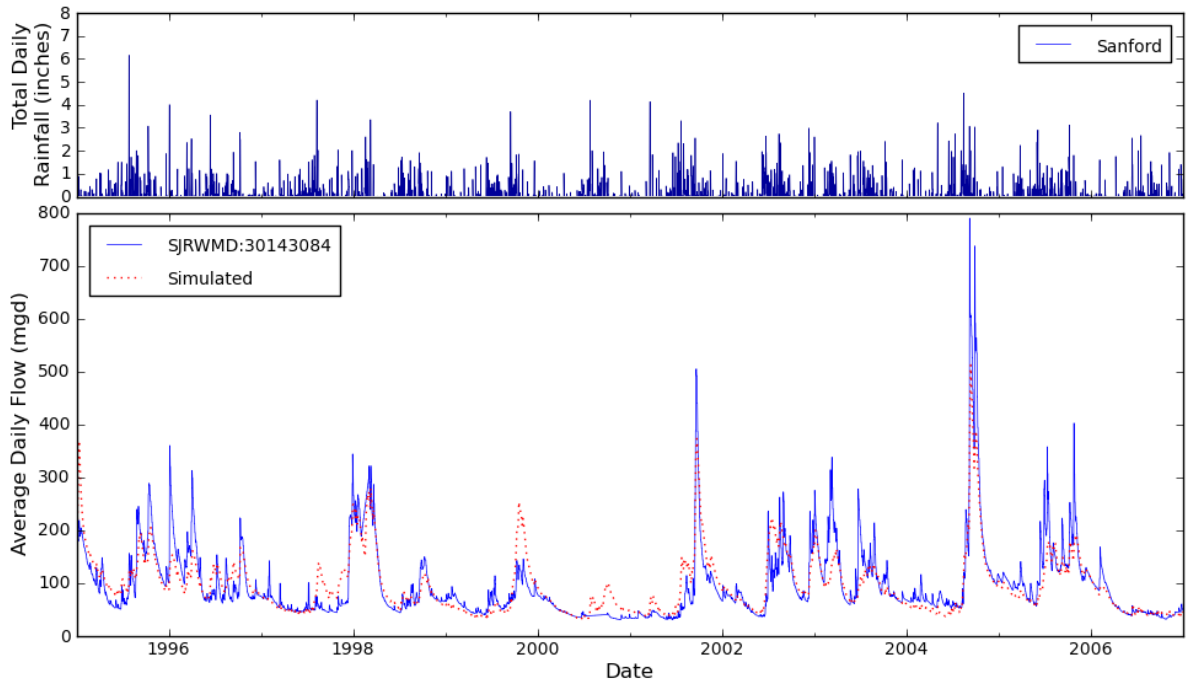

Figure 3.J.51: Black Water Creek near DeBary daily hydrograph

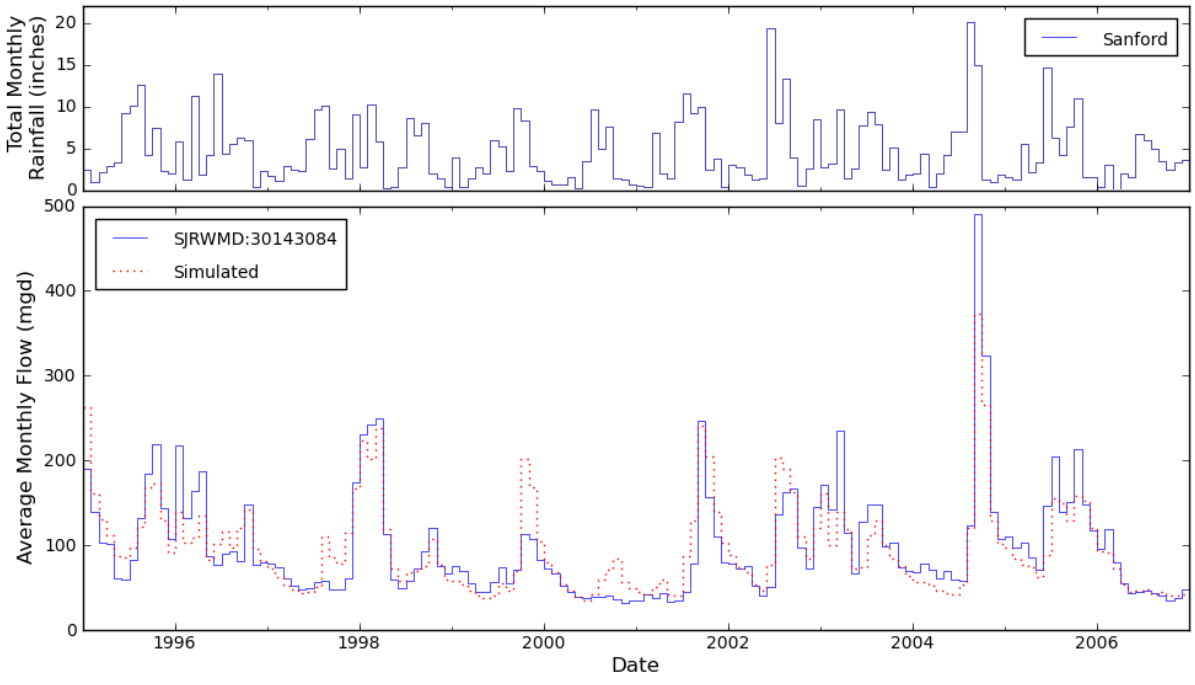

Figure 3.J.52: Black Water Creek near DeBary monthly hydrograph

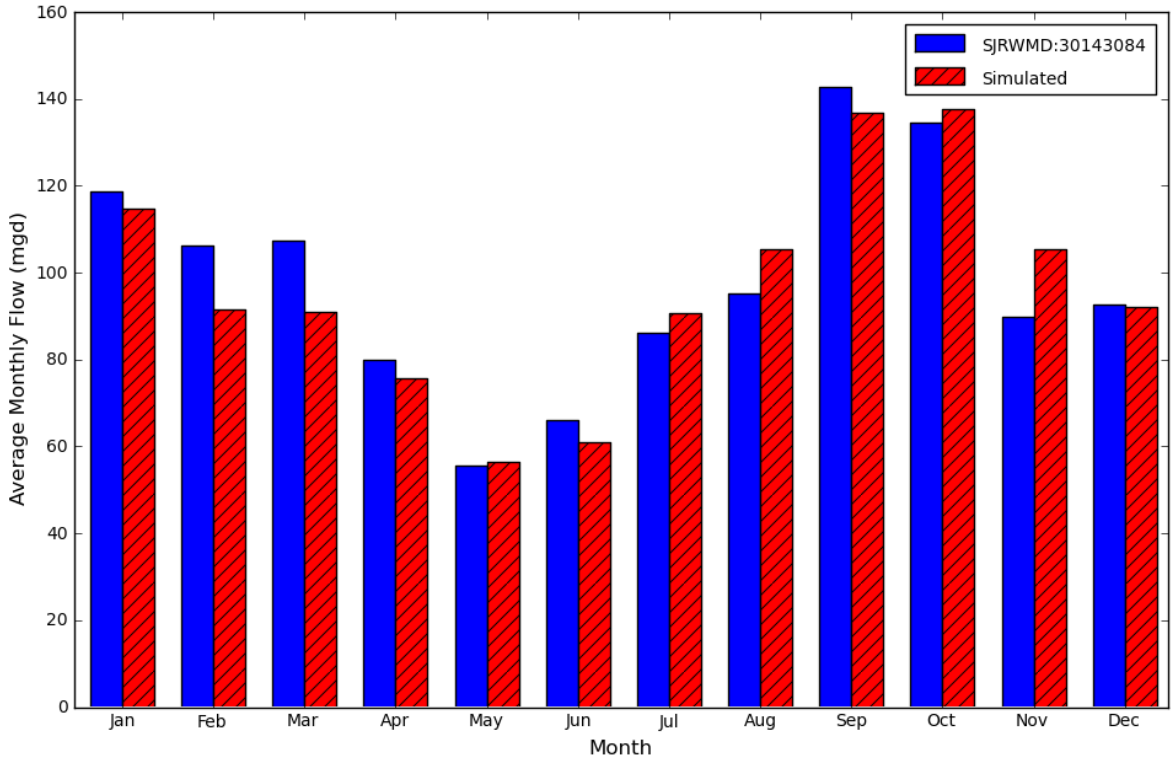

Figure 3.J.53: Black Water Creek near DeBary average monthly flow

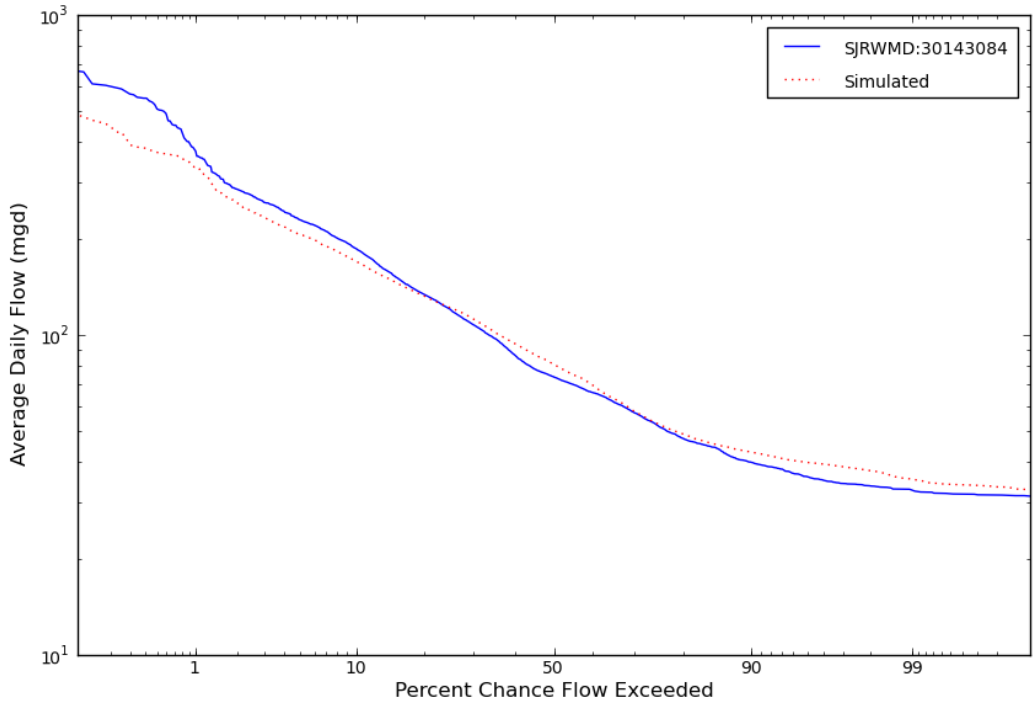

Figure 3.J.54: Black Water Creek near DeBary exceedance probability curve

4E WEKIVA RIVER WATERSHED. LITTLE WEKIVA RIVER SUBWATERSHEDS

Daily flow data monitored at SJRWMD gage 09502132, Little Wekiva River at Springs Landing, is used to compare to simulated flow and adjust model parameters. The gage was installed and operated by USGS starting 6/1/1995, but is now maintained by SJRWMD. The gage is located about 4.6 miles upstream from the confluence with Wekiva River. While USGS maintained the gage the quality of the data was fair. The calibration period is from 6/1/1995 to 12/31/2006.

Model development initially included reviewing and adopting parameters from the adjacent Howell Creek watershed model. Inflow was added from Palm Spring, Sanlando Spring, and Starbuck Spring at appropriate locations along the Little Wekiva River. Spring flow is measured at various intervals, values are interpolated to obtain daily values. The Little Wekiva River is a complex lake system in an urban setting. For the purpose of this study incorporating the details of each lake and outlet was not considered essential. The model was simplified by combining many of the upstream urban drainage systems into dummy lake reaches.

Calibration of the Little Wekiva River overall produces a good match to gauged flow. The Nash-Sutcliffe efficiency is 0.66 and the percent error of the mean flow is -1.56. Comparison of the simulated daily flow to gauged flow at gage 09502132 shows that simulated peak discharge occurs more frequently and generally overestimates the gauged peak discharge. Low flows are more closely matched with the exception of the period of winter 2001 when gauged low flows dropped to 20 cfs while simulated flows stayed above 30 cfs. This is due to the spring flow input, which was about 30 cfs during this period. Comparison of the average monthly flow shows that the seasonal trends are generally represented. The month of September is the largest mismatch. This results from underestimating September for ten of the twelve years, with September 2004 being the largest underestimated September that contributed to the mismatch. The discharge duration curves are close over a majority of the range. The largest departure occurs for the percent chance exceeded of about 90% and greater. While the gauged low flow continues to fall to 10 mgd, the simulated low flow remains above 19 mgd. Also, at the percent chance exceeded of 0.1 the gauged peak flow is about 350 mgd while the simulated peak flow is above 400 mgd.

Table 3.J.21: Calibration Model Performance

Nash-Sutcliffe (Monthly Mean Flow)	Percent Error of the Mean
0.66	-1.56

Table 3.J.22: Descriptive Calibration Statistics

Statistic (Daily Flow (mgd))	Observed (SJRWMD:09502132)	Simulated
Average	54.39	53.54
Median	40.07	41.62
Variance	1853.70	1687.61
Standard Deviation	43.05	41.08
Skew	2.66	3.34
Kurtosis	9.92	18.69
Minimum	9.05	17.85
Maximum	418.81	510.36
Range	409.76	492.51

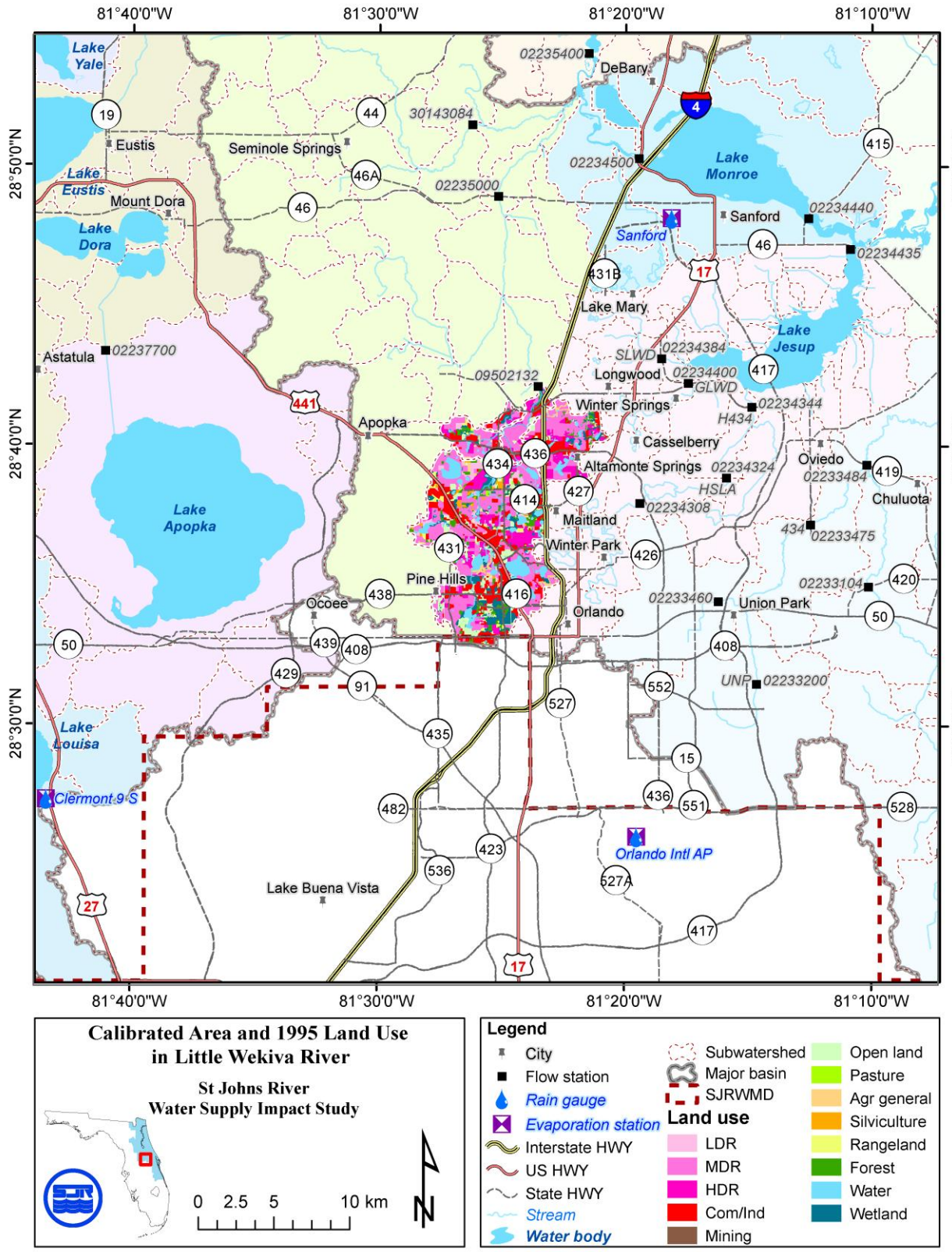

Figure 3.J.55: Little Wekiva River land use map

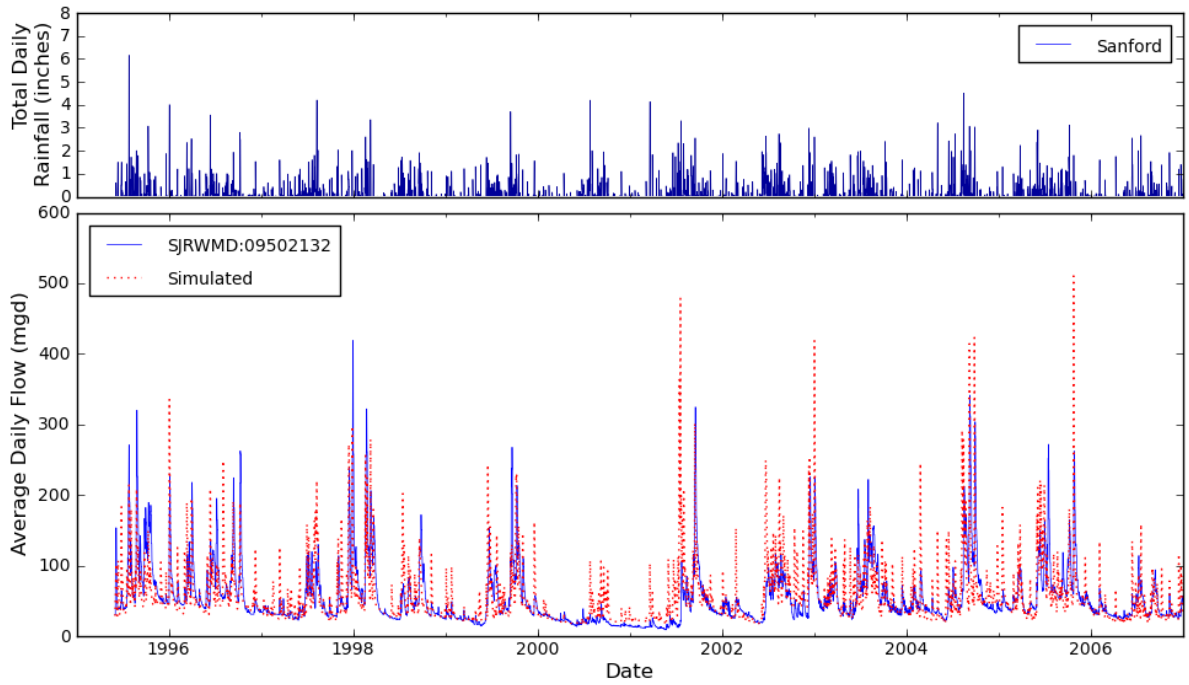

Figure 3.J.56: Little Wekiva River daily hydrograph

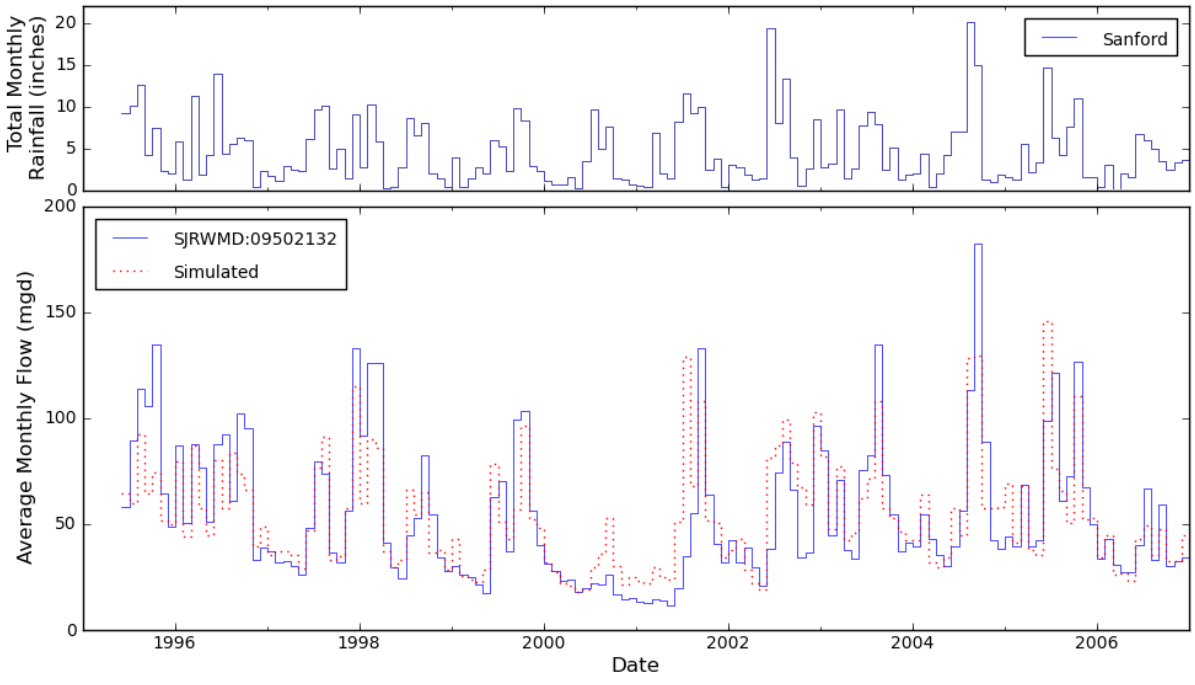

Figure 3.J.57: Little Wekiva River monthly hydrograph

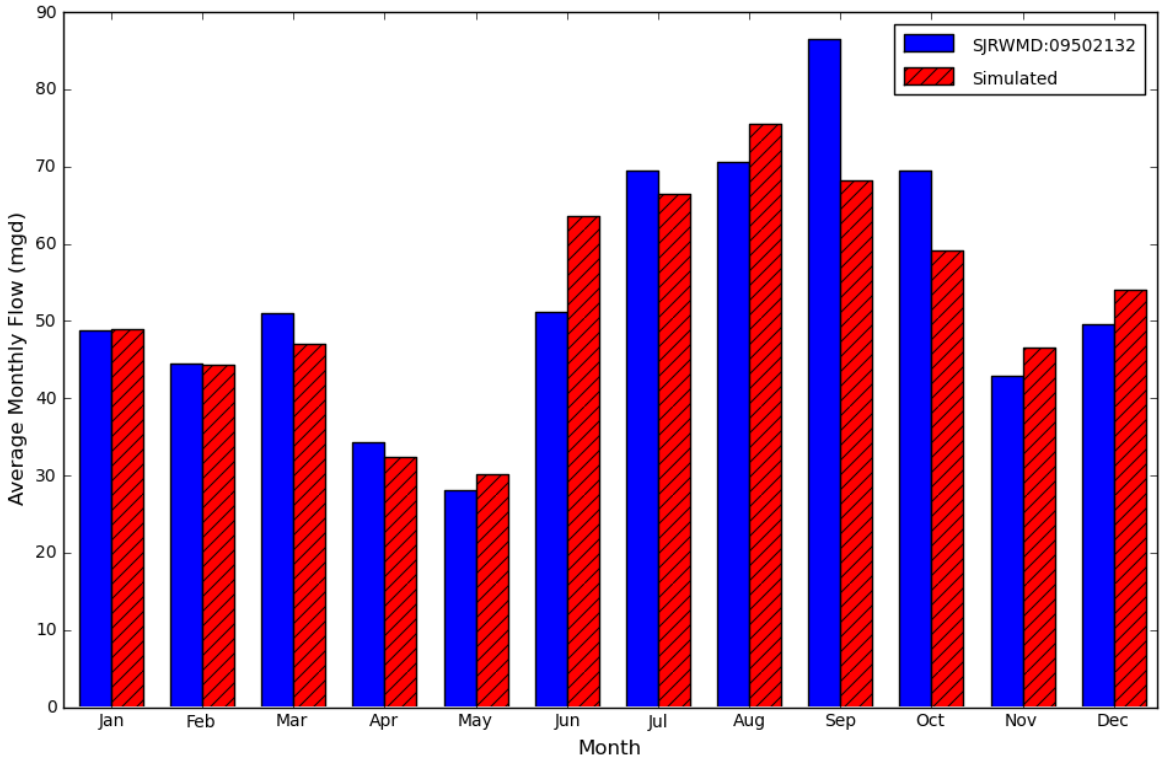

Figure 3.J.58: Little Wekiva River average monthly flow

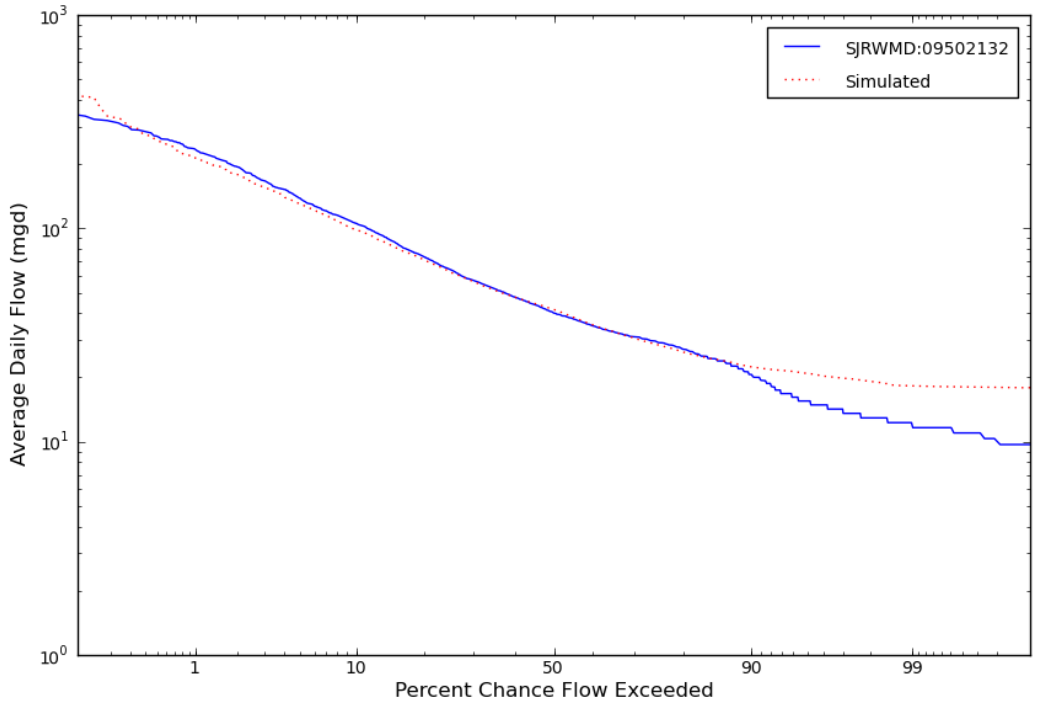

Figure 3.J.59: Little Wekiva River exceedance probability curve

4E WEKIVA RIVER WATERSHED. WEKIVA RIVER NEAR SANFORD SUBWATERSHEDS

Daily flow data monitored at USGS gage 0223500, Wekiva near Sanford, is used to compare to simulated flow and calibrate the Wekiva River model. The gage is located at the State Highway 46 bridge about 6.7 miles upstream from the mouth. The gage began recording in October 1935. The data quality is fair. The calibration period is from 1/1/1995 to 12/31/2006. Flow at this location includes the inflow from Little Wekiva River.

Initial model parameters are developed by reviewing and adopting parameters from the adjacent Alexander Springs watershed model. Inflow from the Little Wekiva River section of the model is included after calibrating the Little Wekiva River section of the model. Inflow from Rock Spring, Wekiva Spring, Miami Spring, and additional minor springs were added at appropriate locations along the Wekiva River. Spring flow is measured at various intervals, values are interpolated to obtain daily values. Additional minor springs includes Middlebrook, Withering, Barrel, Sulpher, Nova, and Island springs. The additional minor springs are input as one constant inflow.

Calibration of the Wekiva River overall produces a good match to gauged flow. The Nash-Sutcliffe efficiency is 0.68 and the percent error of the mean flow is -2.36. Comparison of simulated daily discharge to gauged discharge shows that the hydrograph trend is matched. The largest peak discharge, occurring during the fall 2004, is overestimated. The low flow conditions are matched well. Low flow tends to be about 100 to 140 mgd; about 100 to 135 mgd is spring flow input. Comparison of average monthly flow shows that seasonal trends are represented. In agreement with the negative percent error of the mean the majority of the simulated average months, although close, are less than the gauged result. The discharge duration curves are close throughout the entire range displayed.

Table 3.J.23: Calibration Model Performance

Nash-Sutcliffe (Monthly Mean Flow)	Percent Error of the Mean
0.68	-2.36

Table 3.J.24: Descriptive Calibration Statistics

Statistic (Daily Flow (mgd))	Observed (USGS:2235000)	Simulated
Average	201.01	196.26
Median	174.09	179.12
Variance	8471.20	6541.19
Standard Deviation	92.04	80.88
Skew	2.51	2.76
Kurtosis	8.72	13.62
Minimum	89.98	98.41
Maximum	911.53	1054.91
Range	821.55	956.49

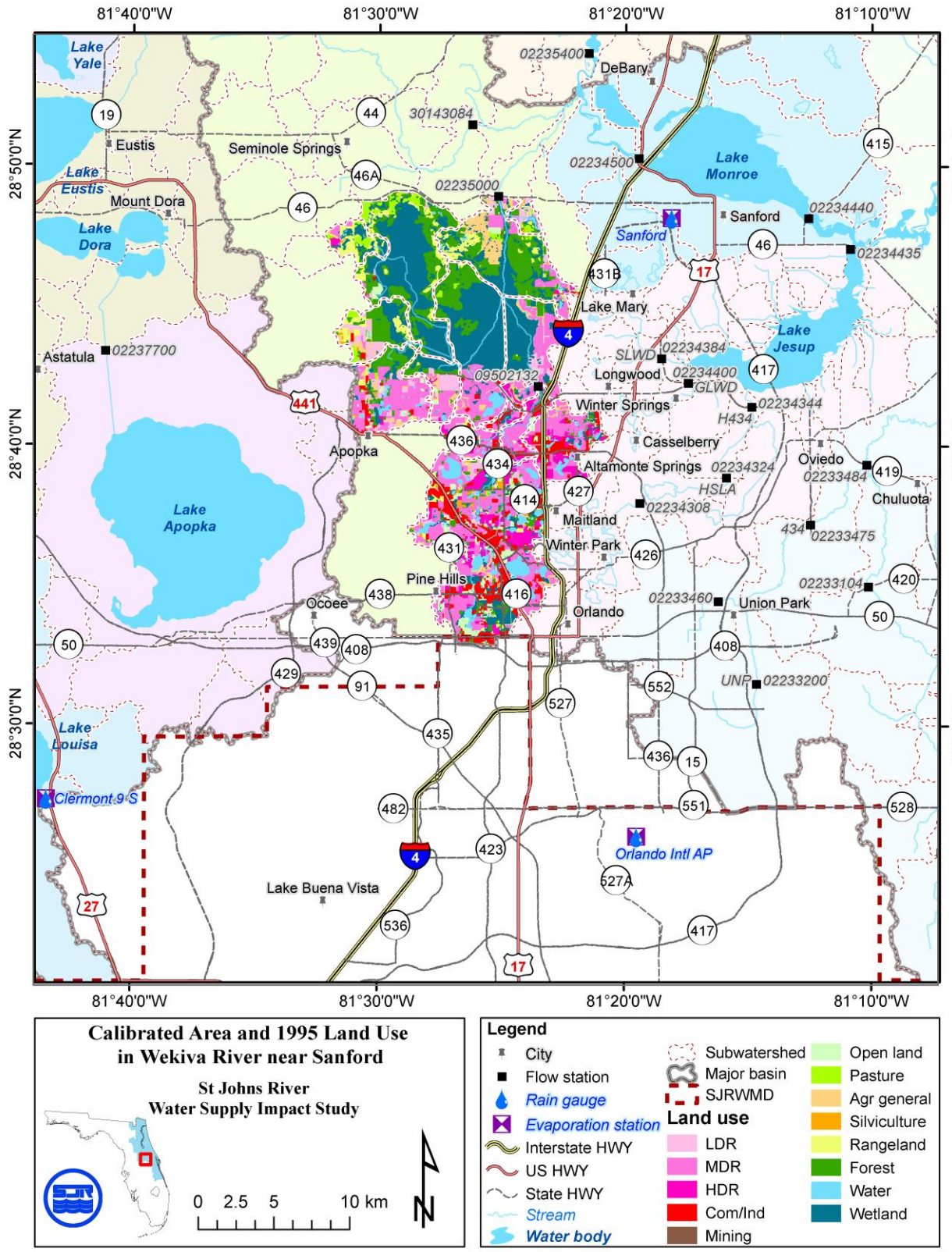

Figure 3.J.60: Wekiva River near Sanford land use map

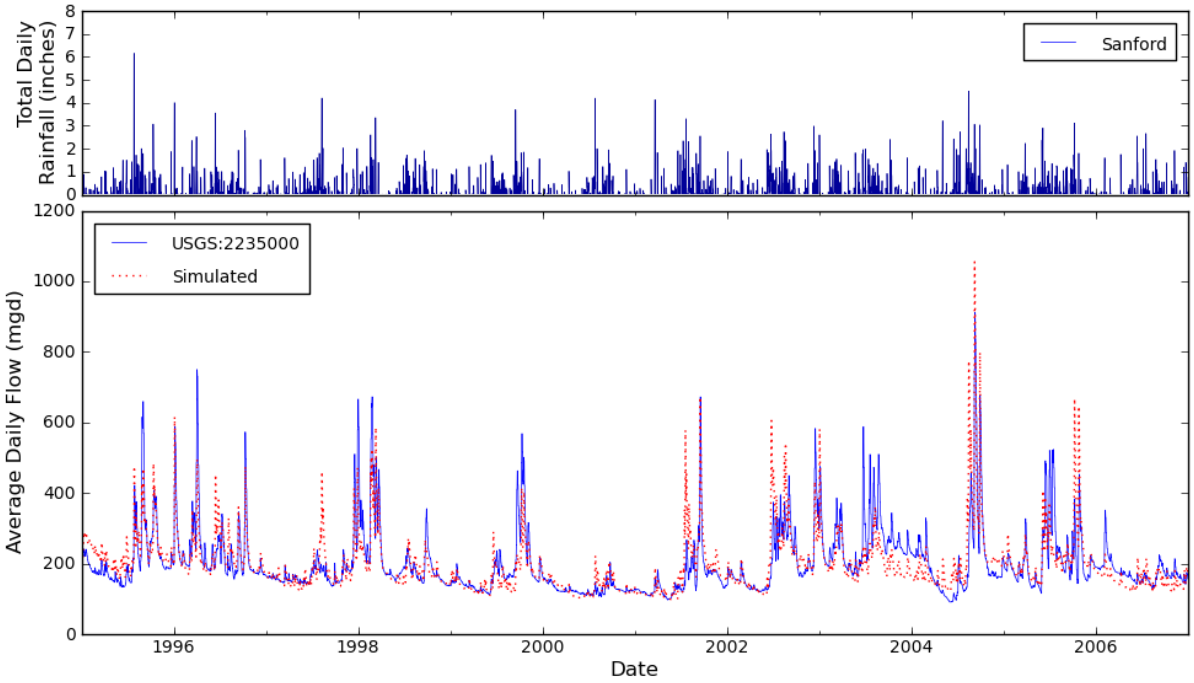

Figure 3.J.61: Wekiva River near Sanford daily hydrograph

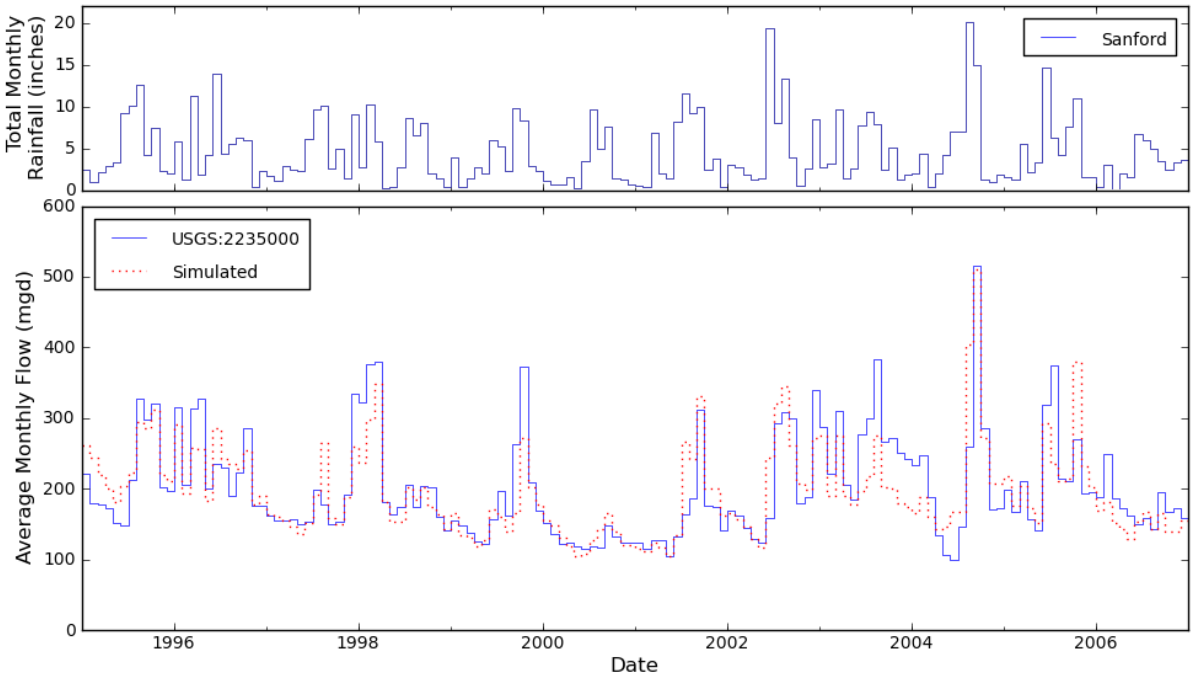

Figure 3.J.62: Wekiva River near Sanford monthly hydrograph

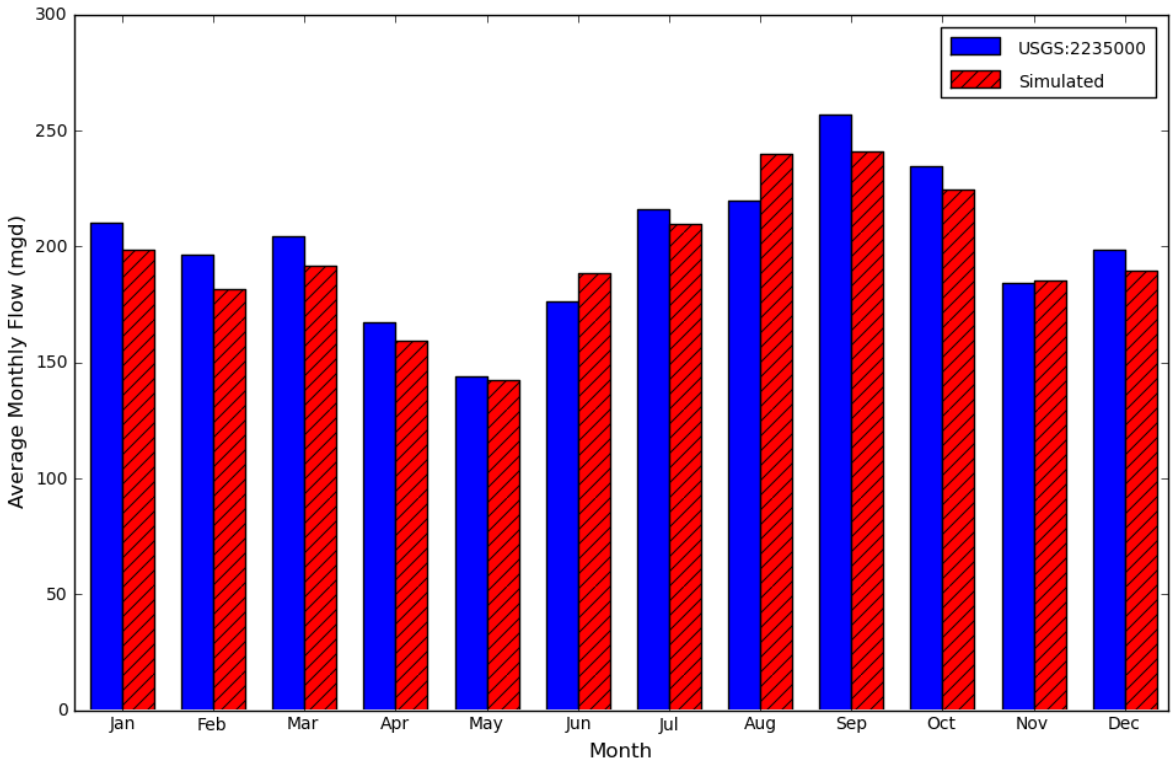

Figure 3.J.63: Wekiva River near Sanford average monthly flow

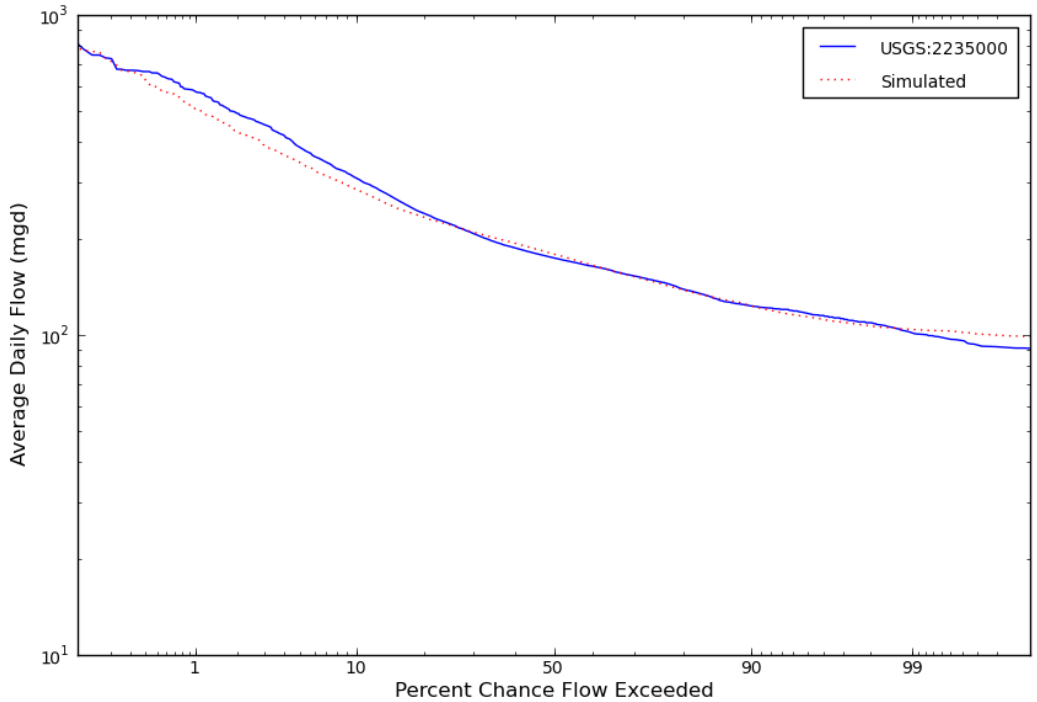

Figure 3.J.64: Wekiva River near Sanford exceedance probability curve