# Appendix for Model 03070205

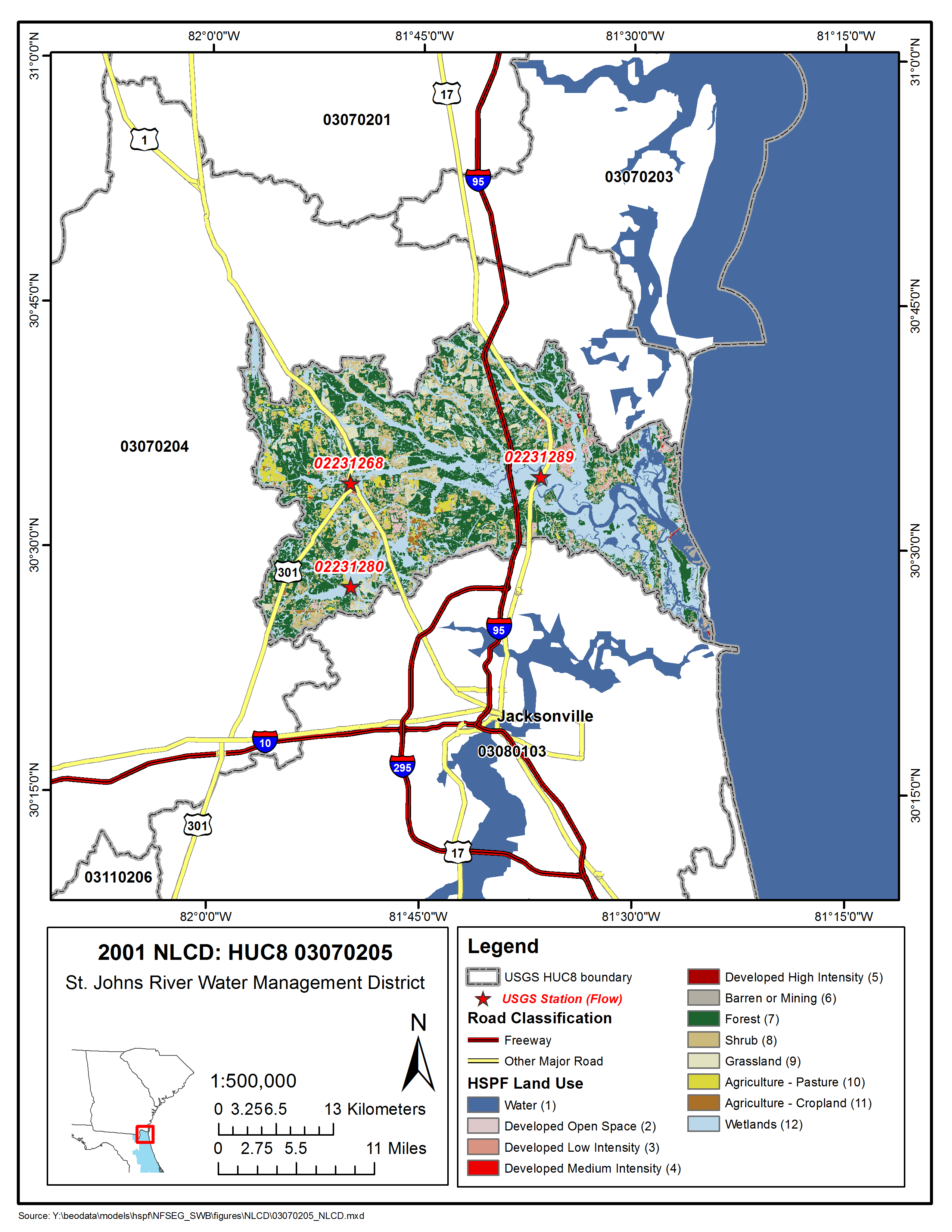


Figure 03070205-1: Land Cover from the National Land Cover Database.

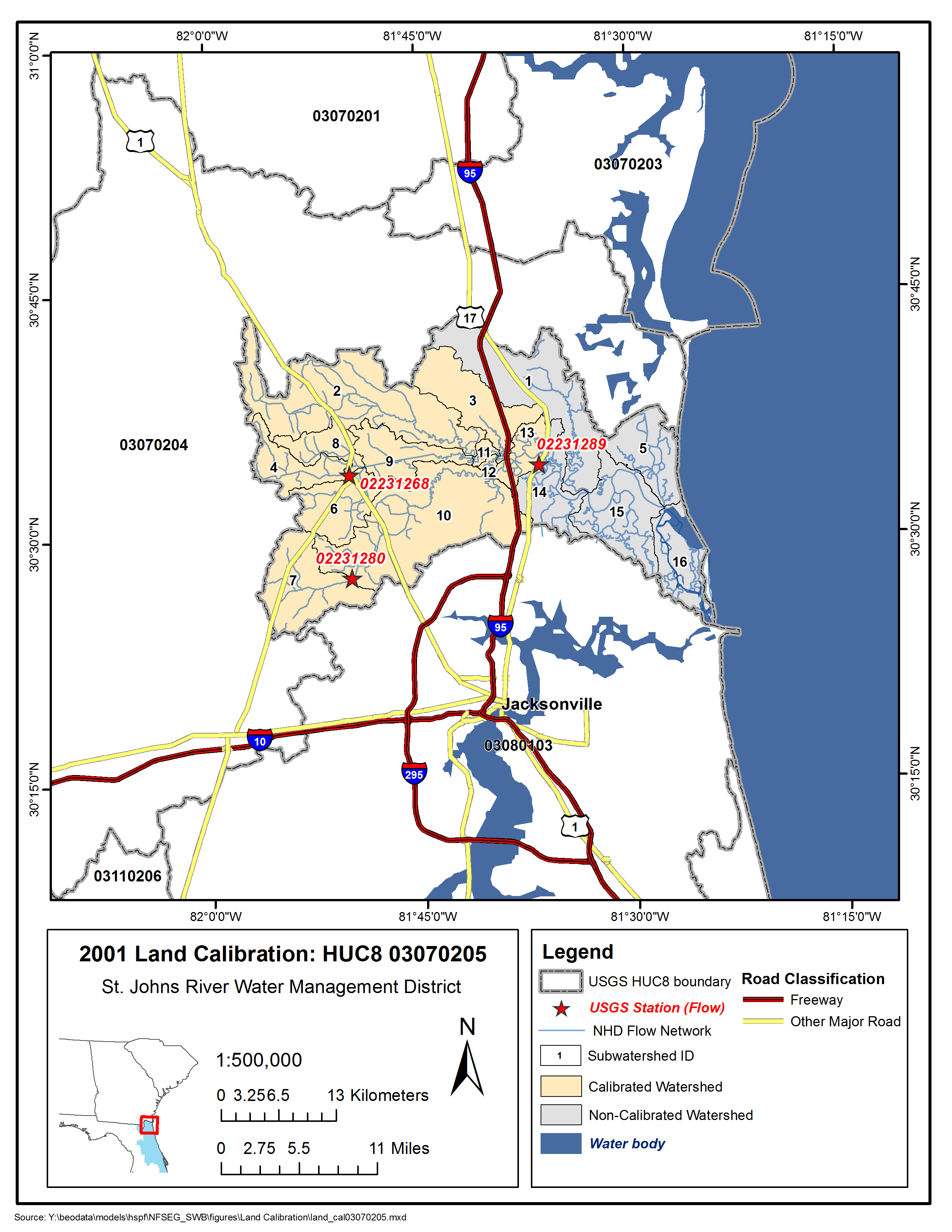


Figure 03070205-2: Calibrated sub-watersheds.

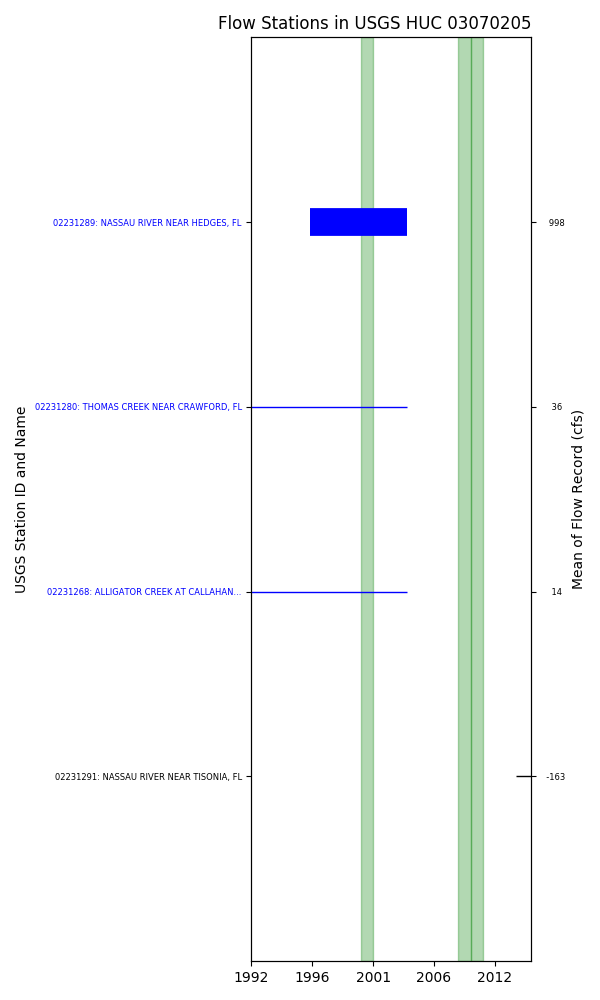


Figure 03070205-3: Station period of record. Blue color identifies gauges used for calibration.

## HSPF Reach 04, USGS Gauge 02231268

Table 03070205-1: Comparison Statistics Between HSPF Reach 04 and USGS Gauge 02231268.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | 3.04 |
| Standard error | 10.88 |
| Relative bias | 0.21 |
| Relative standard error | 0.45 |
| Nash-Sutcliffe coefficient | 0.80 |
| Kling-Gupta coefficient | 0.77 |
| Coefficient of efficiency | 0.53 |
| Index of agreement | 0.76 |

Table 03070205-2: Hydrologic Indices Between USGS Gauge 02231268 and HSPF Reach 04.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02231268 | Simulated Reach 04 | Percent Difference |
| MA1: Mean, all daily flows | 14.80 | 17.85 | 20.62 |
| MA2: Median, all daily flows | 3.10 | 4.53 | 46.28 |
| MA3: CV, all daily flows | 263.74 | 262.53 | -0.46 |
| MA4: CV, log of all daily flows | 164.71 | 146.36 | -11.14 |
| MA5: Mean daily flow / median daily flow | 4.77 | 3.94 | -17.55 |
| MA9: (Q10 - Q90) / median daily flow | 9.65 | 8.03 | -16.72 |
| MA10: (Q20 - Q80) / median daily flow | 3.98 | 3.84 | -3.38 |
| MA11: (Q25 - Q75) / median daily flow | 2.90 | 2.86 | -1.44 |
| MA12: Mean monthly flow, January | 16.25 | 20.32 | 25.02 |
| MA13: Mean monthly flow, February | 19.63 | 19.94 | 1.58 |
| MA14: Mean monthly flow, March | 22.99 | 22.99 | 0.01 |
| MA15: Mean monthly flow, April | 9.17 | 8.59 | -6.38 |
| MA16: Mean monthly flow, May | 2.27 | 3.35 | 47.20 |
| MA17: Mean monthly flow, June | 8.30 | 15.00 | 80.64 |
| MA18: Mean monthly flow, July | 10.09 | 19.85 | 96.64 |
| MA19: Mean monthly flow, August | 23.51 | 21.87 | -6.99 |
| MA20: Mean monthly flow, September | 25.98 | 31.62 | 21.71 |
| MA21: Mean monthly flow, October | 21.55 | 26.68 | 23.82 |
| MA22: Mean monthly flow, November | 4.68 | 8.83 | 88.72 |
| MA23: Mean monthly flow, December | 10.17 | 11.40 | 12.17 |
| ML1: Mean minimum monthly flow, January | 3.46 | 2.18 | -36.90 |
| ML2: Mean minimum monthly flow, February | 4.09 | 3.12 | -23.78 |
| ML3: Mean minimum monthly flow, March | 3.81 | 2.22 | -41.83 |
| ML4: Mean minimum monthly flow, April | 0.82 | 1.41 | 70.53 |
| ML5: Mean minimum monthly flow, May | 0.09 | 0.61 | 614.12 |
| ML6: Mean minimum monthly flow, June | 0.45 | 0.59 | 31.66 |
| ML7: Mean minimum monthly flow, July | 0.71 | 1.68 | 136.66 |
| ML8: Mean minimum monthly flow, August | 1.15 | 1.90 | 65.40 |
| ML9: Mean minimum monthly flow, September | 1.50 | 1.98 | 32.42 |
| ML10: Mean minimum monthly flow, October | 0.99 | 2.15 | 116.71 |
| ML11: Mean minimum monthly flow, November | 1.53 | 2.32 | 51.47 |
| ML12: Mean minimum monthly flow, December | 2.39 | 2.62 | 9.74 |
| ML13: CV of minimum monthly flows | 129.68 | 90.84 | -29.95 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.01 | 0.04 | 408.95 |
| ML15: Mean minimum annual flow / mean annual flow | 0.00 | 0.01 | 316.62 |
| ML16: Median minimum annual flow / median annual flow | 0.00 | 0.03 |  |
| ML20: Ratio of baseflow volume to total flow volume | 0.16 | 0.16 | -0.67 |
| ML22: Mean annual minimum flow divided by catchment area | 0.00 | 0.00 | 276.58 |
| RA1: Mean of positive changes from one day to next (rise rate) | 13.62 | 18.75 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 340.32 | 350.48 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 6.34 | 7.43 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 344.63 | 486.82 |  |
| RA5: Ratio of days that are higher than previous day | 0.28 | 0.28 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.41 | 0.34 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.24 | 0.20 |  |
| RA8: Number of flow reversals from one day to the next | 82.86 | 90.21 |  |
| RA9: CV, number of flow reversals from one day to the next | 9.65 | 10.89 |  |

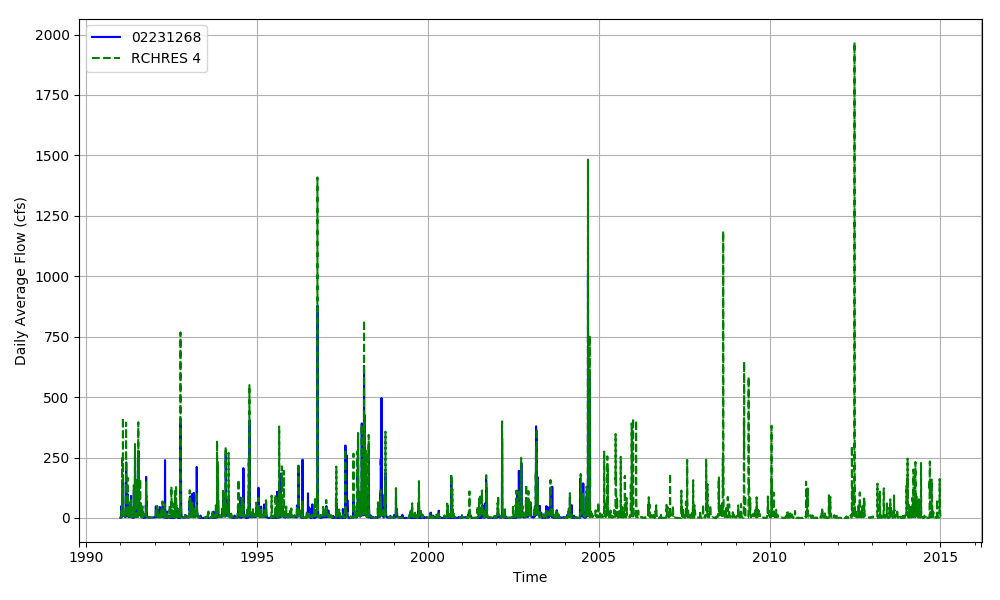


Figure 03070205-4: Daily flow for HSFP reach 04 and USGS station 02231268.

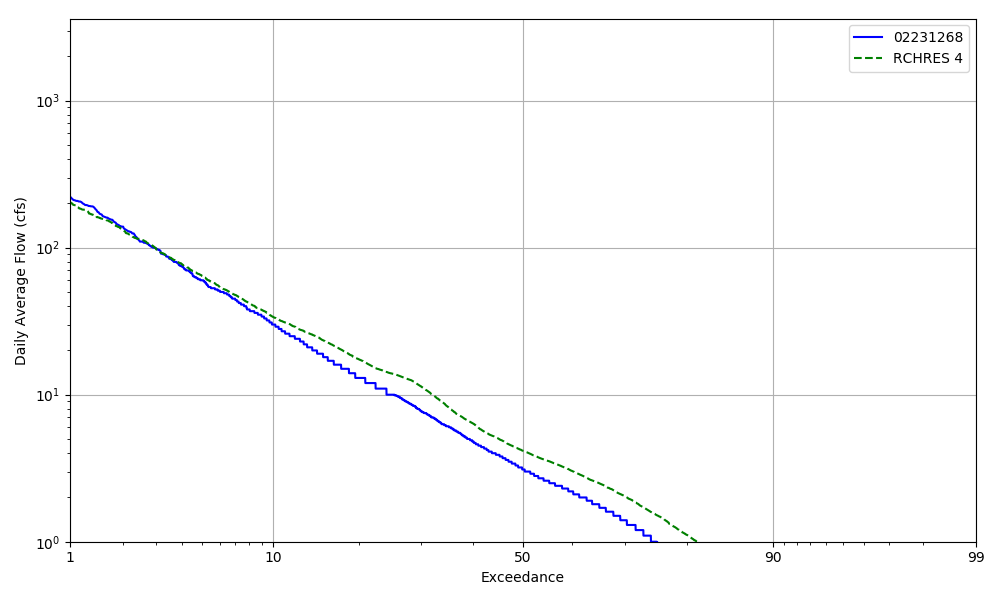


Figure 03070205-5: Daily exceedance for HSFP reach 04 and USGS station 02231268.

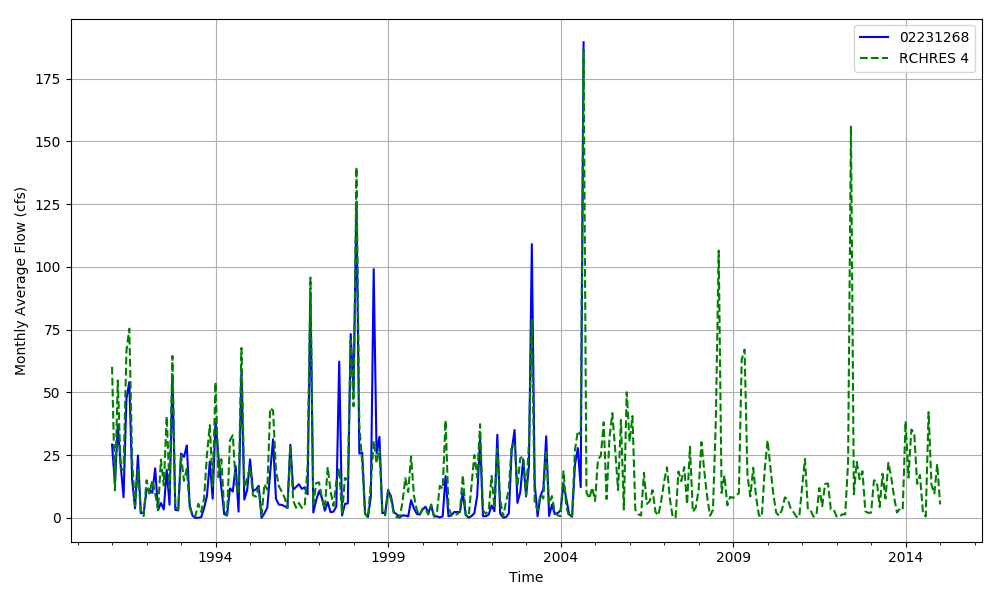


Figure 03070205-6: Monthly flow for HSFP reach 04 and USGS station 02231268.

## HSPF Reach 07, USGS Gauge 02231280

Table 03070205-3: Comparison Statistics Between HSPF Reach 07 and USGS Gauge 02231280.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | -2.78 |
| Standard error | 28.11 |
| Relative bias | -0.07 |
| Relative standard error | 0.47 |
| Nash-Sutcliffe coefficient | 0.77 |
| Kling-Gupta coefficient | 0.76 |
| Coefficient of efficiency | 0.54 |
| Index of agreement | 0.75 |

Table 03070205-4: Hydrologic Indices Between USGS Gauge 02231280 and HSPF Reach 07.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02231280 | Simulated Reach 07 | Percent Difference |
| MA1: Mean, all daily flows | 38.08 | 35.28 | -7.35 |
| MA2: Median, all daily flows | 10.00 | 8.44 | -15.63 |
| MA3: CV, all daily flows | 299.49 | 265.42 | -11.38 |
| MA4: CV, log of all daily flows | 148.96 | 145.08 | -2.61 |
| MA5: Mean daily flow / median daily flow | 3.81 | 4.18 | 9.81 |
| MA9: (Q10 - Q90) / median daily flow | 7.91 | 8.81 | 11.35 |
| MA10: (Q20 - Q80) / median daily flow | 3.19 | 4.30 | 34.70 |
| MA11: (Q25 - Q75) / median daily flow | 2.11 | 3.50 | 65.96 |
| MA12: Mean monthly flow, January | 32.91 | 39.25 | 19.27 |
| MA13: Mean monthly flow, February | 43.30 | 41.01 | -5.28 |
| MA14: Mean monthly flow, March | 56.65 | 45.65 | -19.42 |
| MA15: Mean monthly flow, April | 22.82 | 16.48 | -27.79 |
| MA16: Mean monthly flow, May | 8.09 | 6.52 | -19.49 |
| MA17: Mean monthly flow, June | 19.26 | 28.50 | 47.96 |
| MA18: Mean monthly flow, July | 30.65 | 36.44 | 18.92 |
| MA19: Mean monthly flow, August | 50.86 | 41.11 | -19.18 |
| MA20: Mean monthly flow, September | 73.76 | 68.94 | -6.53 |
| MA21: Mean monthly flow, October | 66.40 | 52.51 | -20.91 |
| MA22: Mean monthly flow, November | 17.46 | 16.86 | -3.44 |
| MA23: Mean monthly flow, December | 26.88 | 23.01 | -14.40 |
| ML1: Mean minimum monthly flow, January | 10.08 | 3.83 | -62.00 |
| ML2: Mean minimum monthly flow, February | 10.59 | 5.30 | -49.98 |
| ML3: Mean minimum monthly flow, March | 10.75 | 4.02 | -62.58 |
| ML4: Mean minimum monthly flow, April | 4.35 | 2.38 | -45.33 |
| ML5: Mean minimum monthly flow, May | 2.34 | 1.11 | -52.67 |
| ML6: Mean minimum monthly flow, June | 2.50 | 1.05 | -58.07 |
| ML7: Mean minimum monthly flow, July | 3.55 | 3.02 | -14.73 |
| ML8: Mean minimum monthly flow, August | 4.66 | 3.06 | -34.46 |
| ML9: Mean minimum monthly flow, September | 6.24 | 3.30 | -47.07 |
| ML10: Mean minimum monthly flow, October | 5.66 | 3.89 | -31.23 |
| ML11: Mean minimum monthly flow, November | 7.01 | 4.22 | -39.75 |
| ML12: Mean minimum monthly flow, December | 8.25 | 4.78 | -42.14 |
| ML13: CV of minimum monthly flows | 80.91 | 85.37 | 5.52 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.13 | 0.04 | -66.13 |
| ML15: Mean minimum annual flow / mean annual flow | 0.04 | 0.01 | -72.44 |
| ML16: Median minimum annual flow / median annual flow | 0.11 | 0.04 | -61.36 |
| ML20: Ratio of baseflow volume to total flow volume | 0.24 | 0.15 | -39.12 |
| ML22: Mean annual minimum flow divided by catchment area | 0.02 | 0.00 | -77.28 |
| RA1: Mean of positive changes from one day to next (rise rate) | 34.32 | 37.00 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 526.15 | 360.38 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 14.35 | 15.07 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 572.58 | 480.35 |  |
| RA5: Ratio of days that are higher than previous day | 0.27 | 0.29 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.25 | 0.35 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.14 | 0.21 |  |
| RA8: Number of flow reversals from one day to the next | 87.79 | 92.71 |  |
| RA9: CV, number of flow reversals from one day to the next | 9.96 | 9.94 |  |

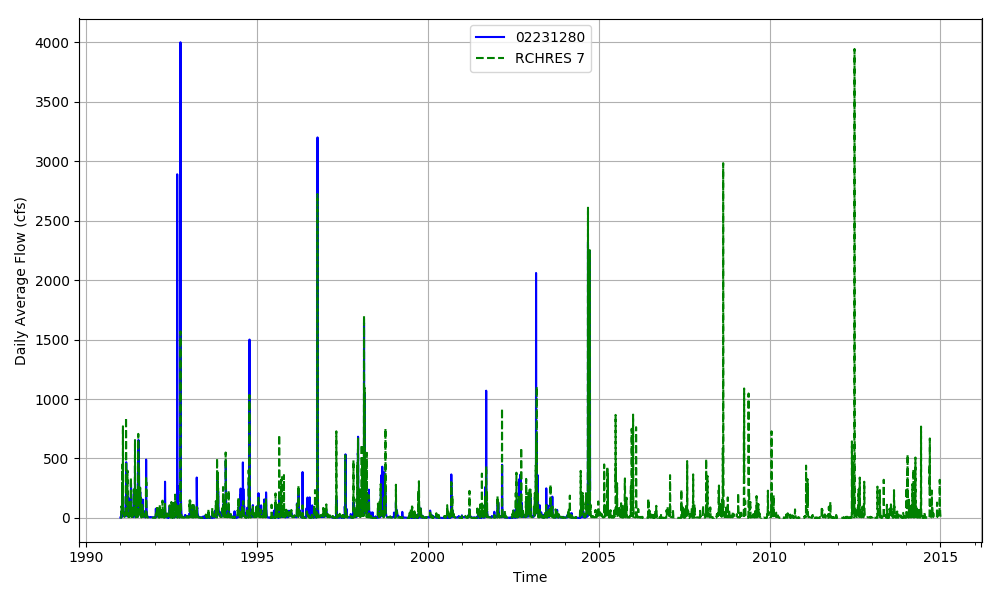


Figure 03070205-7: Daily flow for HSFP reach 07 and USGS station 02231280.

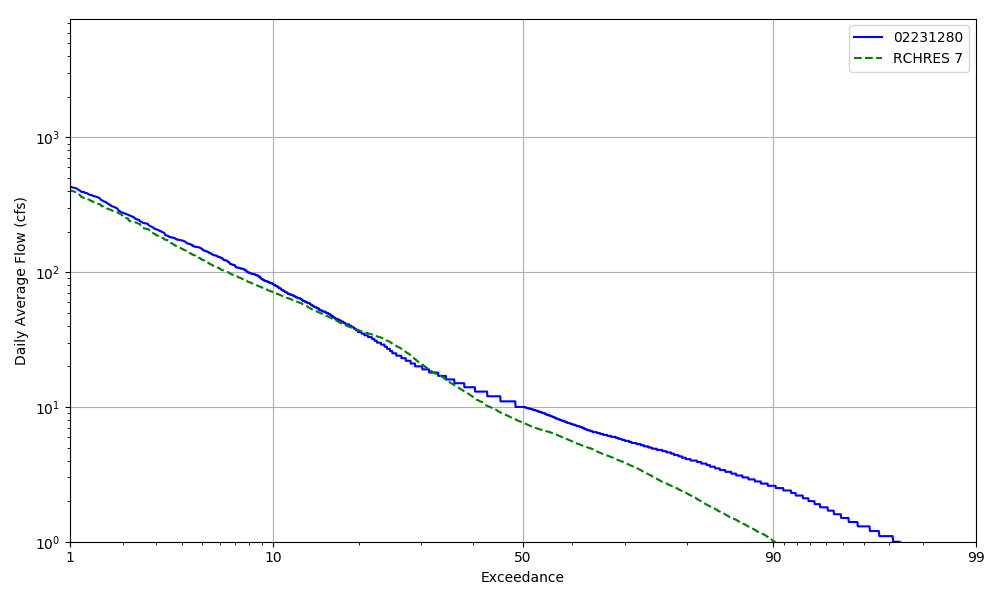


Figure 03070205-8: Daily exceedance for HSFP reach 07 and USGS station 02231280.

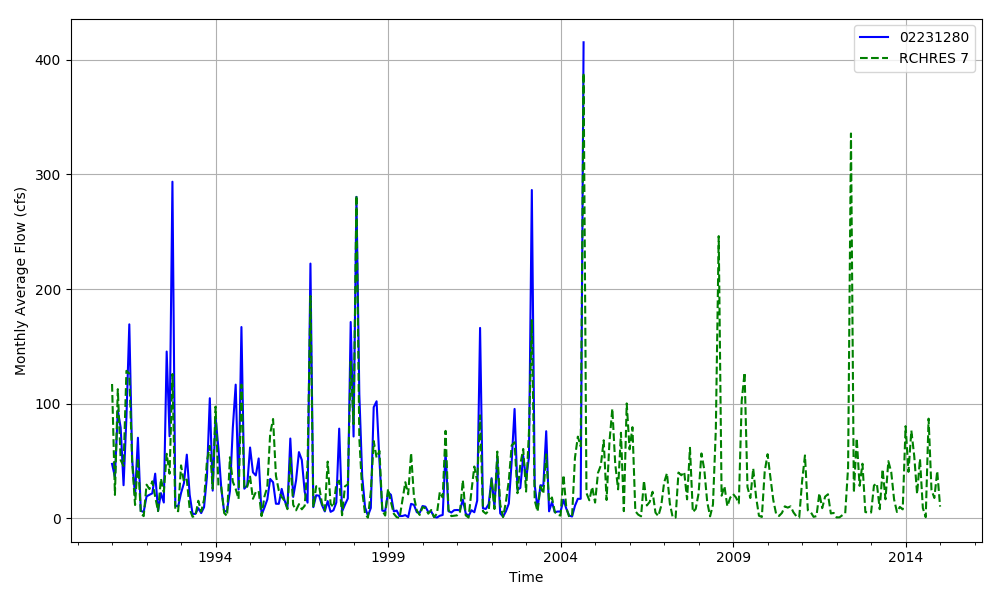


Figure 03070205-9: Monthly flow for HSFP reach 07 and USGS station 02231280.

## HSPF Reach 13, USGS Gauge 02231289

Table 03070205-5: Comparison Statistics Between HSPF Reach 13 and USGS Gauge 02231289.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | -781.64 |
| Standard error | 1794.69 |
| Relative bias | -0.72 |
| Relative standard error | 1.14 |
| Nash-Sutcliffe coefficient | -0.30 |
| Kling-Gupta coefficient | -0.38 |
| Coefficient of efficiency | 0.12 |
| Index of agreement | 0.51 |

Table 03070205-6: Hydrologic Indices Between USGS Gauge 02231289 and HSPF Reach 13.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02231289 | Simulated Reach 13 | Percent Difference |
| MA1: Mean, all daily flows | 1468.97 | 328.55 | -77.63 |
| MA2: Median, all daily flows | 859.00 | 127.25 | -85.19 |
| MA3: CV, all daily flows | 62.08 | 211.50 | 240.67 |
| MA4: CV, log of all daily flows | 100.45 | 132.20 | 31.61 |
| MA5: Mean daily flow / median daily flow | 1.71 | 2.58 | 50.98 |
| MA9: (Q10 - Q90) / median daily flow | 3.99 | 5.17 | 29.46 |
| MA10: (Q20 - Q80) / median daily flow | 2.44 | 2.36 | -3.07 |
| MA11: (Q25 - Q75) / median daily flow | 1.76 | 1.77 | 0.53 |
| MA12: Mean monthly flow, January | 123.62 | 27.22 | -77.98 |
| MA13: Mean monthly flow, February | 431.95 | 111.64 | -74.16 |
| MA14: Mean monthly flow, March | 719.84 | 232.10 | -67.76 |
| MA15: Mean monthly flow, April | 861.61 | 88.58 | -89.72 |
| MA16: Mean monthly flow, May | 348.16 | 14.53 | -95.83 |
| MA17: Mean monthly flow, June | 939.33 | 95.67 | -89.81 |
| MA18: Mean monthly flow, July | 1221.51 | 240.94 | -80.28 |
| MA19: Mean monthly flow, August | 1428.01 | 333.52 | -76.64 |
| MA20: Mean monthly flow, September | 1879.63 | 741.89 | -60.53 |
| MA21: Mean monthly flow, October | 745.09 | 222.43 | -70.15 |
| MA22: Mean monthly flow, November | 915.29 | 116.20 | -87.30 |
| MA23: Mean monthly flow, December | 983.05 | 141.61 | -85.60 |
| ML1: Mean minimum monthly flow, January | 36.75 | 40.24 | 9.51 |
| ML2: Mean minimum monthly flow, February | 174.00 | 64.97 | -62.66 |
| ML3: Mean minimum monthly flow, March | 521.33 | 94.38 | -81.90 |
| ML4: Mean minimum monthly flow, April | 428.67 | 42.09 | -90.18 |
| ML5: Mean minimum monthly flow, May | 117.50 | 7.72 | -93.43 |
| ML6: Mean minimum monthly flow, June | 399.54 | 10.47 | -97.38 |
| ML7: Mean minimum monthly flow, July | 727.43 | 74.11 | -89.81 |
| ML8: Mean minimum monthly flow, August | 840.17 | 85.64 | -89.81 |
| ML9: Mean minimum monthly flow, September | 1031.86 | 69.22 | -93.29 |
| ML10: Mean minimum monthly flow, October | 55.12 | 61.36 | 11.32 |
| ML11: Mean minimum monthly flow, November | 424.37 | 54.87 | -87.07 |
| ML12: Mean minimum monthly flow, December | 567.50 | 95.20 | -83.23 |
| ML13: CV of minimum monthly flows | 250.24 | 95.85 | -61.70 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.02 | 0.09 | 344.80 |
| ML15: Mean minimum annual flow / mean annual flow | 0.02 | 0.05 | 185.16 |
| ML16: Median minimum annual flow / median annual flow | 0.02 | 0.06 | 185.45 |
| ML20: Ratio of baseflow volume to total flow volume | 0.42 | 0.25 | -40.89 |
| ML22: Mean annual minimum flow divided by catchment area | 0.38 | 0.12 | -69.62 |
| RA1: Mean of positive changes from one day to next (rise rate) | 456.01 | 295.52 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 142.96 | 393.71 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 436.33 | 120.05 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 112.53 | 564.08 |  |
| RA5: Ratio of days that are higher than previous day | 0.49 | 0.29 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.37 | 0.21 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.34 | 0.13 |  |
| RA8: Number of flow reversals from one day to the next | 81.75 | 35.38 |  |
| RA9: CV, number of flow reversals from one day to the next | 44.88 | 62.08 |  |

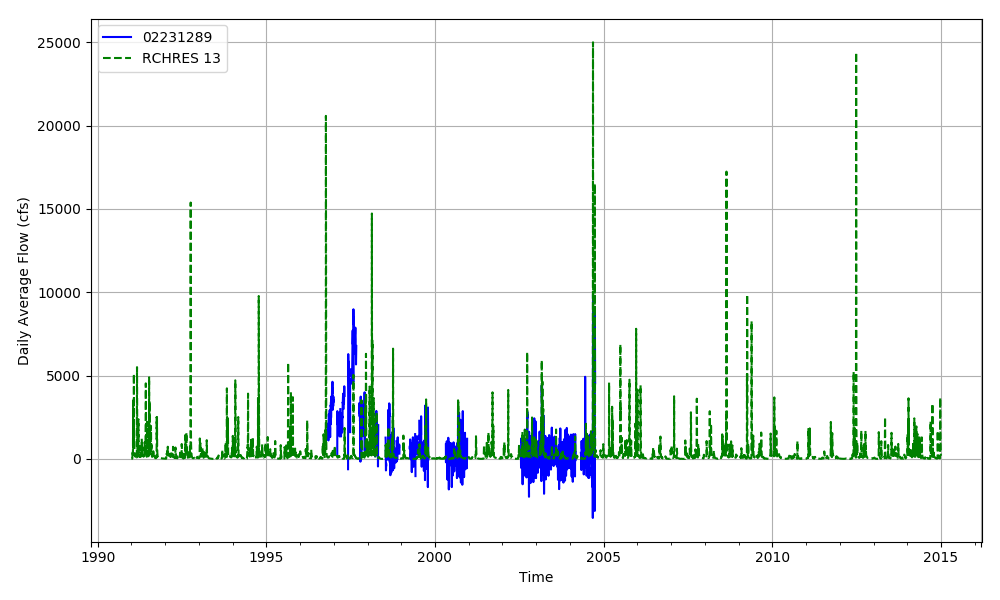


Figure 03070205-10: Daily flow for HSFP reach 13 and USGS station 02231289.

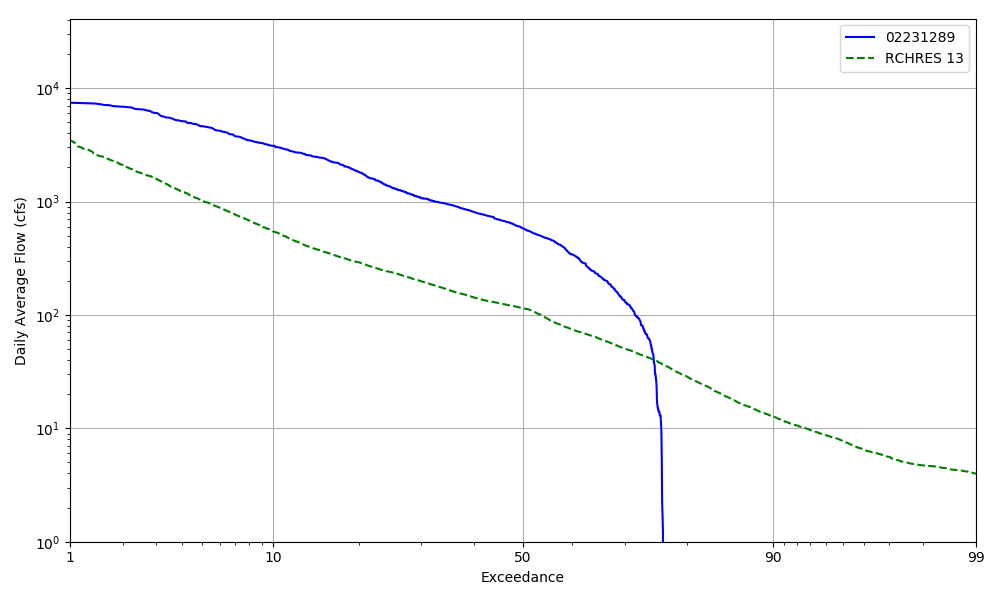


Figure 03070205-11: Daily exceedance for HSFP reach 13 and USGS station 02231289.

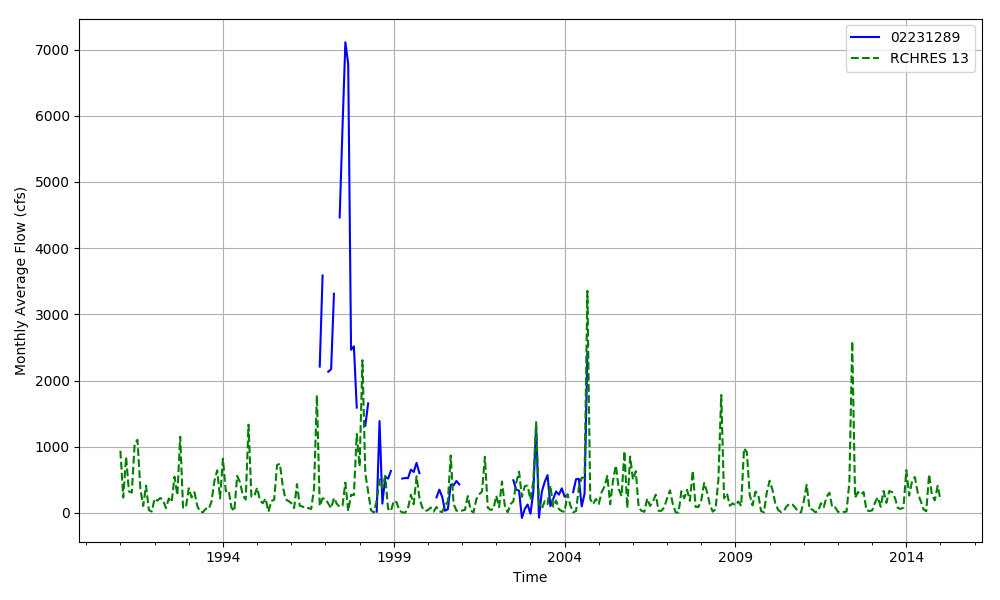


Figure 03070205-12: Monthly flow for HSFP reach 13 and USGS station 02231289.