# Appendix for Model 03060201

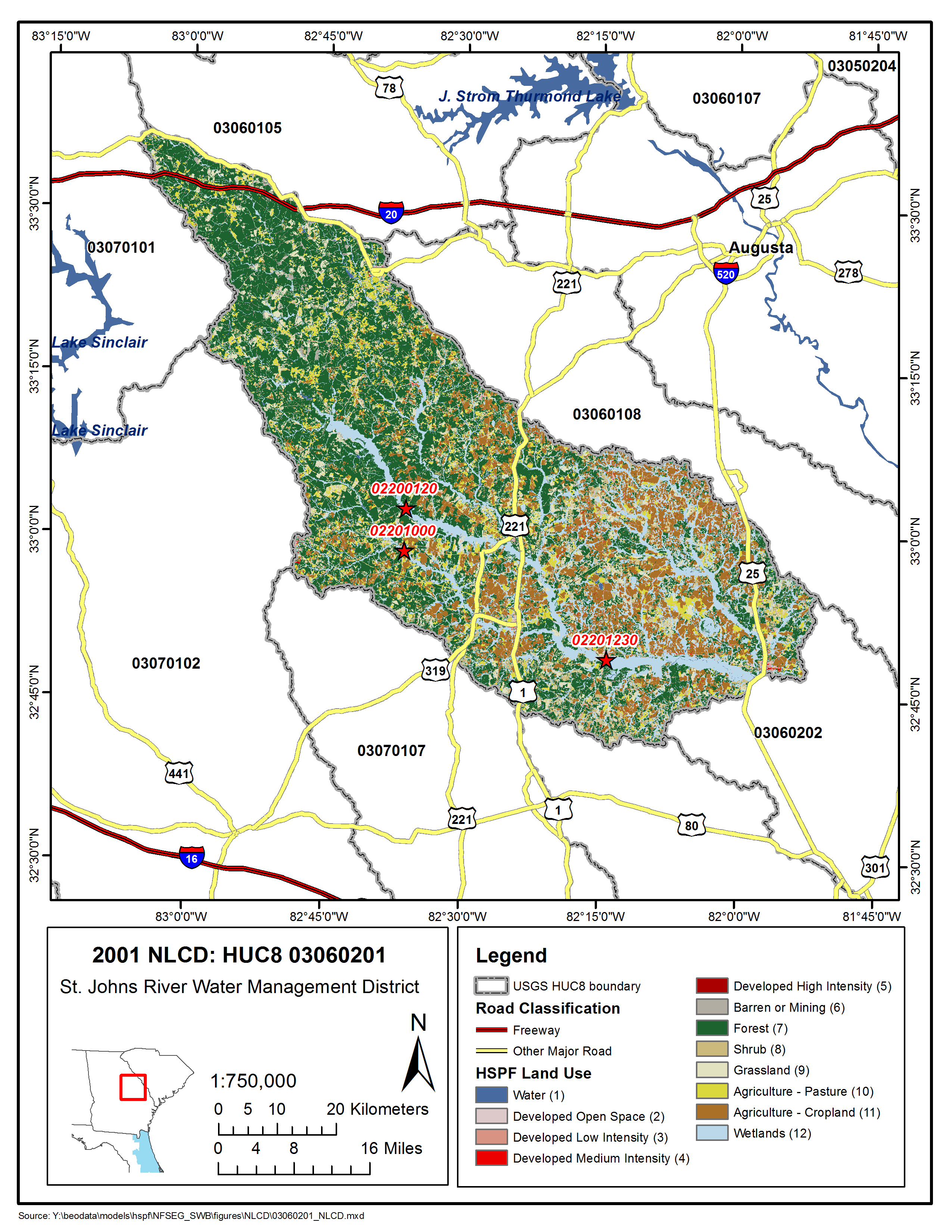


Figure 03060201-1: Land Cover from the National Land Cover Database.

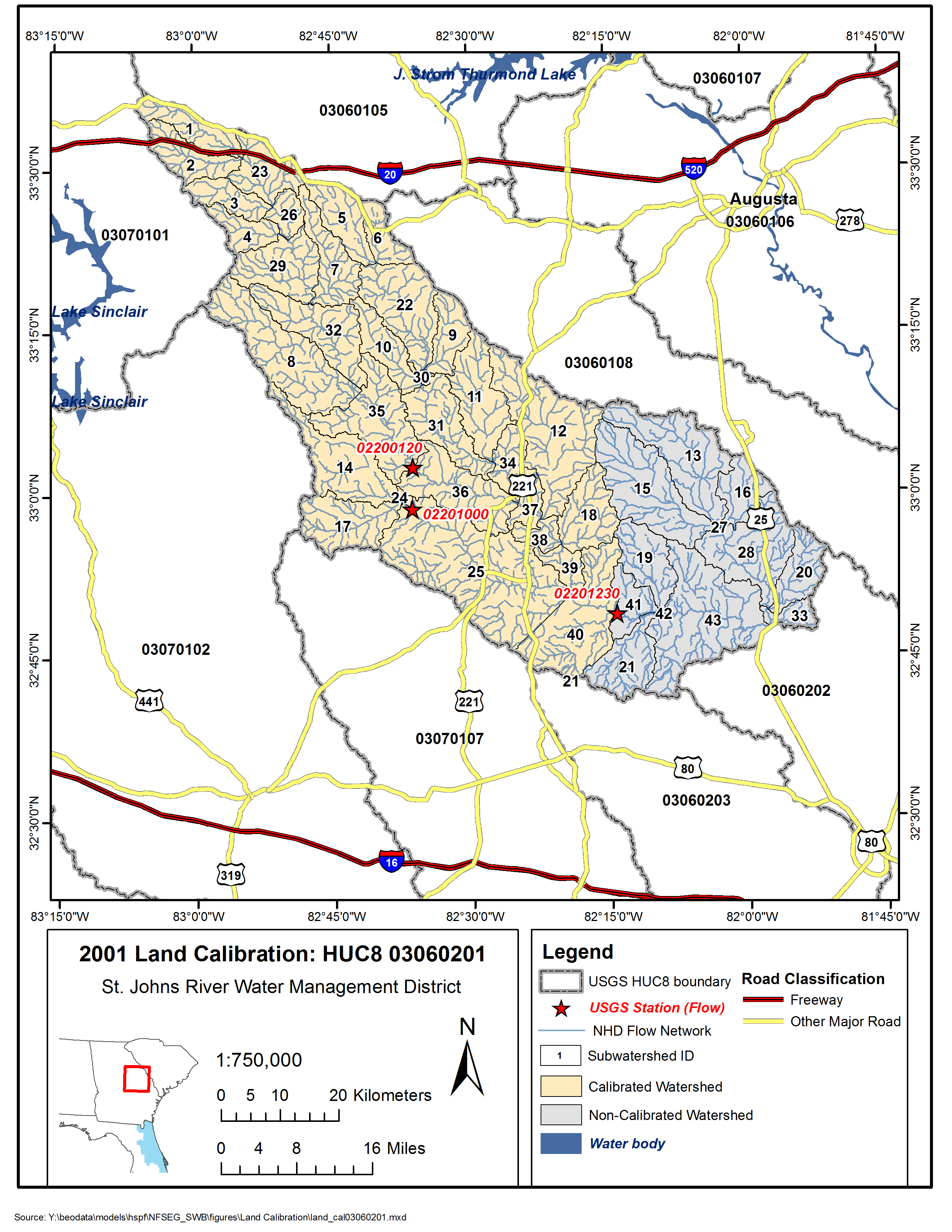


Figure 03060201-2: Calibrated sub-watersheds.

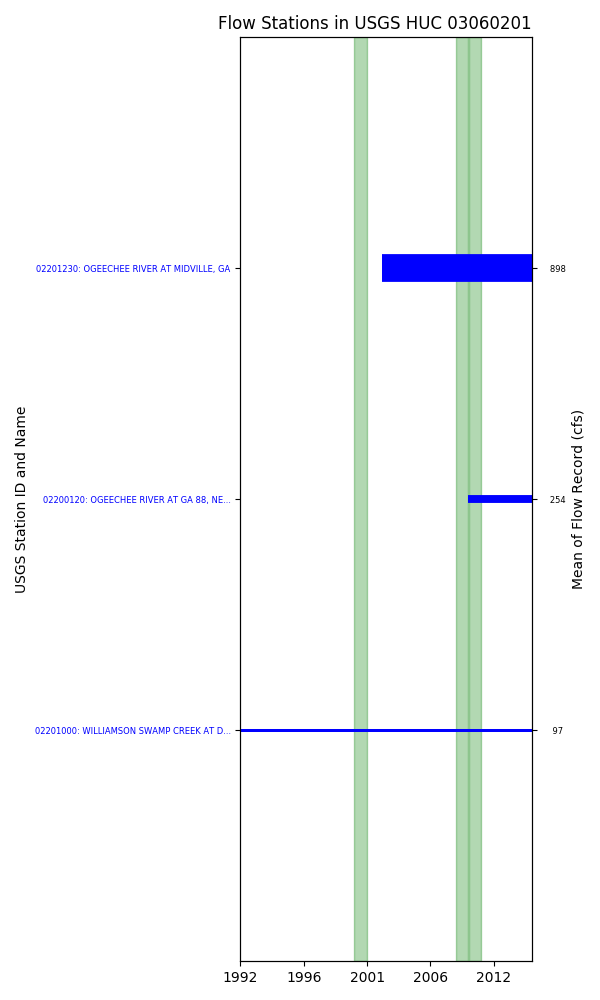


Figure 03060201-3: Station period of record. Blue color identifies gauges used for calibration.

## HSPF Reach 24, USGS Gauge 02201000

Table 03060201-1: Comparison Statistics Between HSPF Reach 24 and USGS Gauge 02201000.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | -0.69 |
| Standard error | 28.38 |
| Relative bias | -0.01 |
| Relative standard error | 0.33 |
| Nash-Sutcliffe coefficient | 0.89 |
| Coefficient of efficiency | 0.70 |
| Index of agreement | 0.85 |

Table 03060201-2: Hydrologic Indices Between USGS Gauge 02201000 and HSPF Reach 24.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02201000 | Simulated Reach 24 | Percent Difference |
| MA1: Mean, all daily flows | 99.46 | 98.69 | -0.77 |
| MA2: Median, all daily flows | 60.00 | 56.56 | -5.73 |
| MA3: CV, all daily flows | 128.62 | 117.79 | -8.42 |
| MA4: CV, log of all daily flows | 86.70 | 91.44 | 5.47 |
| MA5: Mean daily flow / median daily flow | 1.66 | 1.74 | 5.26 |
| MA9: (Q10 - Q90) / median daily flow | 3.04 | 3.36 | 10.51 |
| MA10: (Q20 - Q80) / median daily flow | 1.65 | 1.73 | 4.99 |
| MA11: (Q25 - Q75) / median daily flow | 1.28 | 1.29 | 0.34 |
| MA12: Mean monthly flow, January | 142.23 | 144.05 | 1.28 |
| MA13: Mean monthly flow, February | 163.23 | 171.80 | 5.25 |
| MA14: Mean monthly flow, March | 184.53 | 181.40 | -1.69 |
| MA15: Mean monthly flow, April | 112.06 | 102.18 | -8.82 |
| MA16: Mean monthly flow, May | 72.42 | 63.38 | -12.47 |
| MA17: Mean monthly flow, June | 57.76 | 53.86 | -6.75 |
| MA18: Mean monthly flow, July | 57.32 | 58.43 | 1.93 |
| MA19: Mean monthly flow, August | 65.96 | 60.65 | -8.05 |
| MA20: Mean monthly flow, September | 56.86 | 69.56 | 22.34 |
| MA21: Mean monthly flow, October | 62.55 | 63.30 | 1.19 |
| MA22: Mean monthly flow, November | 71.79 | 72.69 | 1.26 |
| MA23: Mean monthly flow, December | 105.99 | 103.40 | -2.45 |
| ML1: Mean minimum monthly flow, January | 72.00 | 68.41 | -4.99 |
| ML2: Mean minimum monthly flow, February | 81.39 | 79.80 | -1.96 |
| ML3: Mean minimum monthly flow, March | 83.43 | 80.48 | -3.54 |
| ML4: Mean minimum monthly flow, April | 55.83 | 58.94 | 5.57 |
| ML5: Mean minimum monthly flow, May | 33.62 | 37.40 | 11.25 |
| ML6: Mean minimum monthly flow, June | 26.31 | 31.10 | 18.21 |
| ML7: Mean minimum monthly flow, July | 24.31 | 29.10 | 19.67 |
| ML8: Mean minimum monthly flow, August | 23.65 | 29.35 | 24.10 |
| ML9: Mean minimum monthly flow, September | 23.06 | 28.14 | 22.06 |
| ML10: Mean minimum monthly flow, October | 30.19 | 36.08 | 19.50 |
| ML11: Mean minimum monthly flow, November | 42.53 | 44.62 | 4.90 |
| ML12: Mean minimum monthly flow, December | 58.48 | 56.93 | -2.65 |
| ML13: CV of minimum monthly flows | 72.51 | 68.22 | -5.92 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.25 | 0.31 | 24.57 |
| ML15: Mean minimum annual flow / mean annual flow | 0.17 | 0.22 | 24.12 |
| ML16: Median minimum annual flow / median annual flow | 0.24 | 0.28 | 15.97 |
| ML20: Ratio of baseflow volume to total flow volume | 0.54 | 0.57 | 5.69 |
| ML22: Mean annual minimum flow divided by catchment area | 0.17 | 0.20 | 19.33 |
| RA1: Mean of positive changes from one day to next (rise rate) | 55.50 | 35.43 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 285.55 | 373.60 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 27.35 | 17.27 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 348.20 | 304.29 |  |
| RA5: Ratio of days that are higher than previous day | 0.30 | 0.33 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.17 | 0.06 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.10 | 0.06 |  |
| RA8: Number of flow reversals from one day to the next | 97.50 | 114.38 |  |
| RA9: CV, number of flow reversals from one day to the next | 18.18 | 23.25 |  |

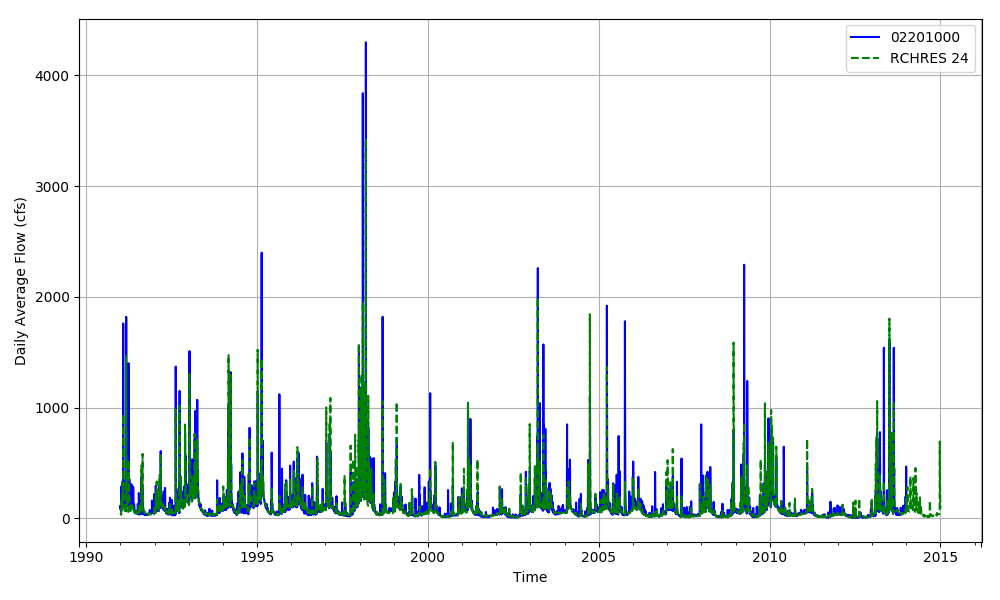


Figure 03060201-4: Daily flow for HSFP reach 24 and USGS station 02201000.

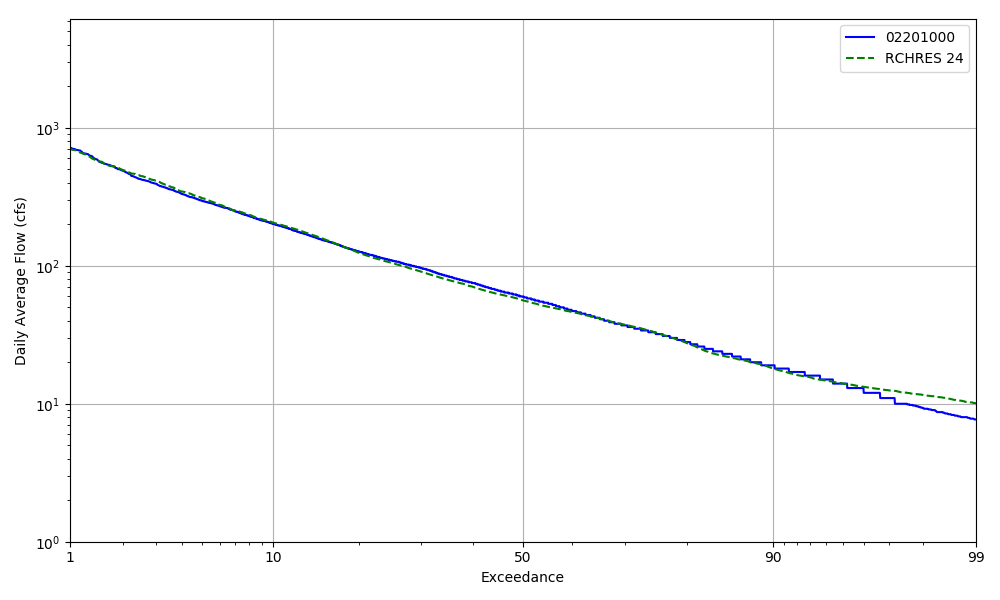


Figure 03060201-5: Daily exceedance for HSFP reach 24 and USGS station 02201000.

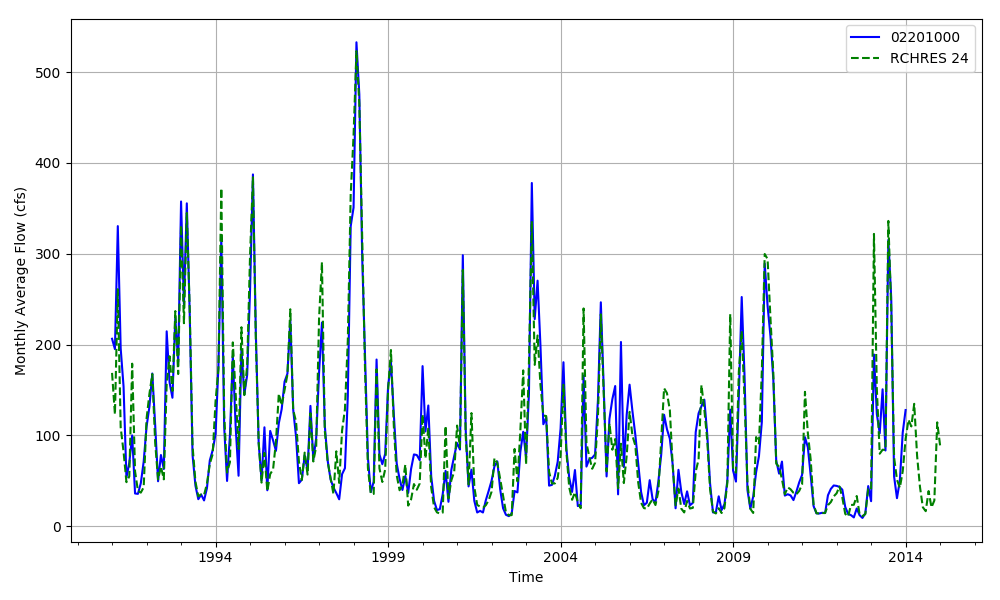


Figure 03060201-6: Monthly flow for HSFP reach 24 and USGS station 02201000.

## HSPF Reach 35, USGS Gauge 02200120

Table 03060201-3: Comparison Statistics Between HSPF Reach 35 and USGS Gauge 02200120.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | -3.48 |
| Standard error | 343.50 |
| Relative bias | -0.01 |
| Relative standard error | 0.57 |
| Nash-Sutcliffe coefficient | 0.67 |
| Coefficient of efficiency | 0.68 |
| Index of agreement | 0.83 |

Table 03060201-4: Hydrologic Indices Between USGS Gauge 02200120 and HSPF Reach 35.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02200120 | Simulated Reach 35 | Percent Difference |
| MA1: Mean, all daily flows | 241.81 | 278.97 | 15.37 |
| MA2: Median, all daily flows | 66.00 | 103.01 | 56.08 |
| MA3: CV, all daily flows | 170.50 | 131.00 | -23.17 |
| MA4: CV, log of all daily flows | 144.16 | 139.61 | -3.16 |
| MA5: Mean daily flow / median daily flow | 3.66 | 2.71 | -26.08 |
| MA9: (Q10 - Q90) / median daily flow | 9.81 | 7.50 | -23.54 |
| MA10: (Q20 - Q80) / median daily flow | 5.04 | 3.88 | -22.91 |
| MA11: (Q25 - Q75) / median daily flow | 3.50 | 2.94 | -16.05 |
| MA12: Mean monthly flow, January | 999.86 | 598.28 | -40.16 |
| MA13: Mean monthly flow, February | 385.35 | 505.23 | 31.11 |
| MA14: Mean monthly flow, March | 365.57 | 416.38 | 13.90 |
| MA15: Mean monthly flow, April | 228.41 | 237.40 | 3.94 |
| MA16: Mean monthly flow, May | 224.21 | 216.93 | -3.24 |
| MA17: Mean monthly flow, June | 101.54 | 127.55 | 25.62 |
| MA18: Mean monthly flow, July | 249.87 | 280.39 | 12.22 |
| MA19: Mean monthly flow, August | 137.10 | 201.49 | 46.96 |
| MA20: Mean monthly flow, September | 32.58 | 51.00 | 56.51 |
| MA21: Mean monthly flow, October | 20.37 | 33.10 | 62.49 |
| MA22: Mean monthly flow, November | 33.07 | 22.56 | -31.78 |
| MA23: Mean monthly flow, December | 454.70 | 507.51 | 11.62 |
| ML1: Mean minimum monthly flow, January | 871.80 | 389.79 | -55.29 |
| ML2: Mean minimum monthly flow, February | 197.50 | 201.16 | 1.85 |
| ML3: Mean minimum monthly flow, March | 216.50 | 239.44 | 10.60 |
| ML4: Mean minimum monthly flow, April | 102.75 | 94.56 | -7.97 |
| ML5: Mean minimum monthly flow, May | 60.02 | 98.07 | 63.39 |
| ML6: Mean minimum monthly flow, June | 33.60 | 69.11 | 105.70 |
| ML7: Mean minimum monthly flow, July | 59.99 | 81.33 | 35.57 |
| ML8: Mean minimum monthly flow, August | 41.67 | 70.29 | 68.67 |
| ML9: Mean minimum monthly flow, September | 19.02 | 11.74 | -38.28 |
| ML10: Mean minimum monthly flow, October | 13.65 | 11.38 | -16.65 |
| ML11: Mean minimum monthly flow, November | 25.15 | 14.06 | -44.10 |
| ML12: Mean minimum monthly flow, December | 232.64 | 264.16 | 13.55 |
| ML13: CV of minimum monthly flows | 315.62 | 196.40 | -37.77 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.12 | 0.11 | -9.28 |
| ML15: Mean minimum annual flow / mean annual flow | 0.03 | 0.03 | -13.81 |
| ML16: Median minimum annual flow / median annual flow | 0.02 | 0.03 | 43.75 |
| ML20: Ratio of baseflow volume to total flow volume | 0.52 | 0.46 | -12.26 |
| ML22: Mean annual minimum flow divided by catchment area | 0.11 | 0.06 | -46.19 |
| RA1: Mean of positive changes from one day to next (rise rate) | 95.51 | 78.72 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 359.28 | 269.49 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 49.65 | 30.03 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 327.69 | 210.37 |  |
| RA5: Ratio of days that are higher than previous day | 0.33 | 0.28 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.15 | 0.14 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.11 | 0.09 |  |
| RA8: Number of flow reversals from one day to the next | 67.80 | 51.60 |  |
| RA9: CV, number of flow reversals from one day to the next | 37.68 | 44.71 |  |

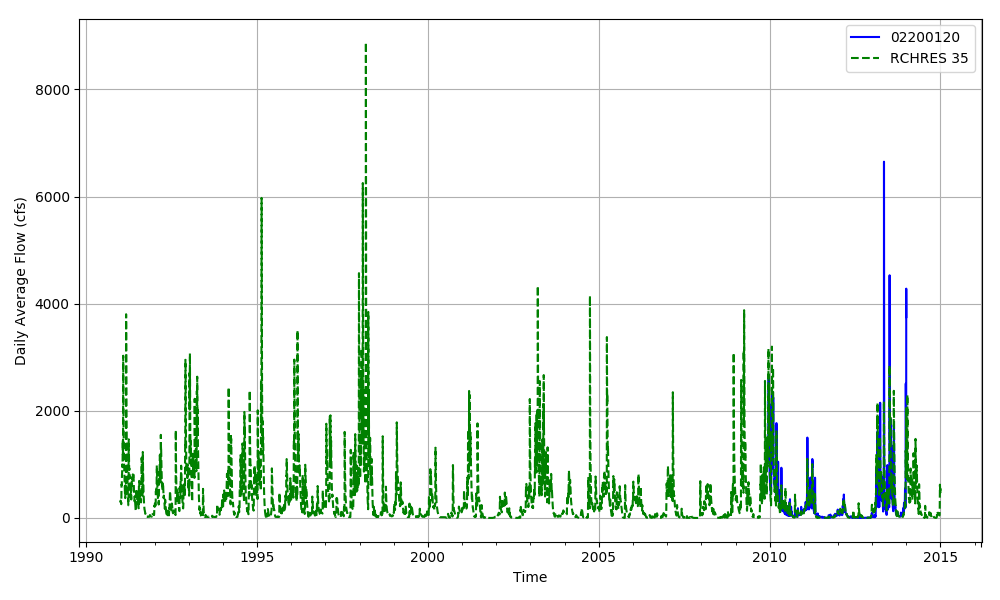


Figure 03060201-7: Daily flow for HSFP reach 35 and USGS station 02200120.

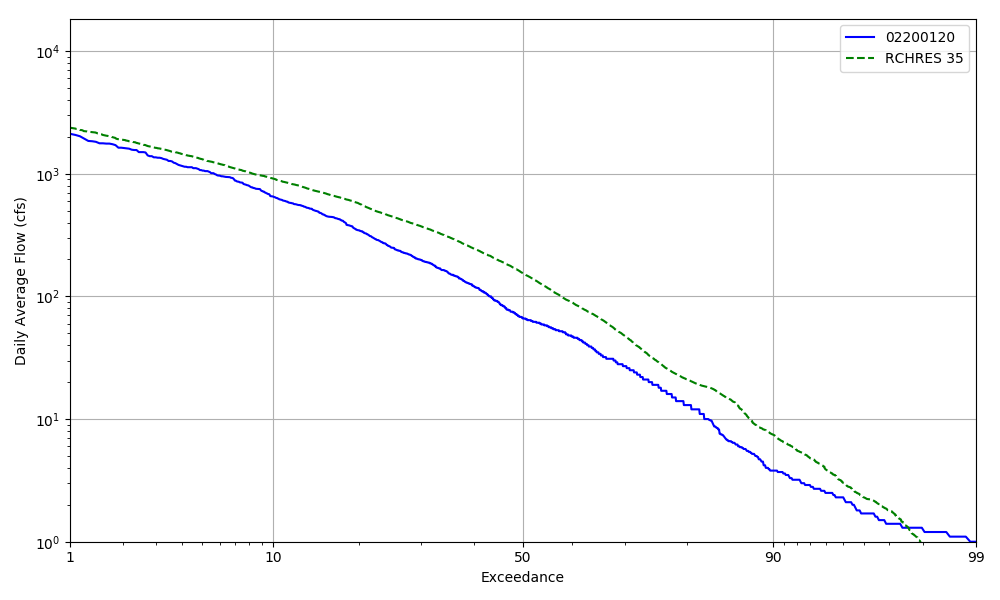


Figure 03060201-8: Daily exceedance for HSFP reach 35 and USGS station 02200120.

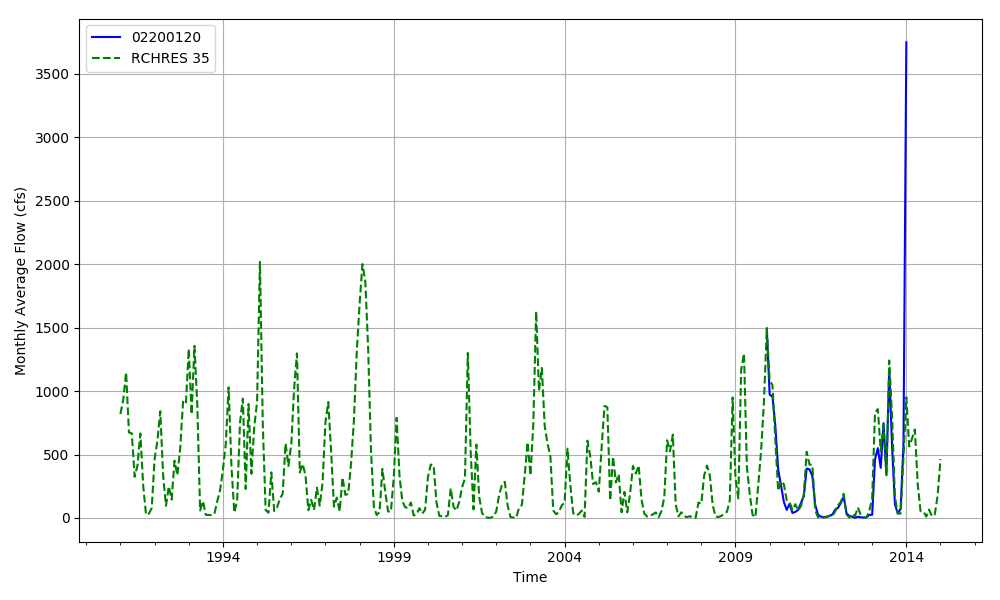


Figure 03060201-9: Monthly flow for HSFP reach 35 and USGS station 02200120.

## HSPF Reach 40, USGS Gauge 02201230

Table 03060201-5: Comparison Statistics Between HSPF Reach 40 and USGS Gauge 02201230.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | -0.43 |
| Standard error | 265.71 |
| Relative bias | -0.00 |
| Relative standard error | 0.27 |
| Nash-Sutcliffe coefficient | 0.92 |
| Coefficient of efficiency | 0.76 |
| Index of agreement | 0.89 |

Table 03060201-6: Hydrologic Indices Between USGS Gauge 02201230 and HSPF Reach 40.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02201230 | Simulated Reach 40 | Percent Difference |
| MA1: Mean, all daily flows | 892.88 | 889.54 | -0.37 |
| MA2: Median, all daily flows | 459.00 | 398.46 | -13.19 |
| MA3: CV, all daily flows | 113.70 | 117.26 | 3.13 |
| MA4: CV, log of all daily flows | 107.40 | 116.70 | 8.66 |
| MA5: Mean daily flow / median daily flow | 1.95 | 2.23 | 14.76 |
| MA9: (Q10 - Q90) / median daily flow | 4.36 | 5.64 | 29.23 |
| MA10: (Q20 - Q80) / median daily flow | 2.63 | 3.43 | 30.58 |
| MA11: (Q25 - Q75) / median daily flow | 2.05 | 2.73 | 33.00 |
| MA12: Mean monthly flow, January | 1171.88 | 1121.93 | -4.26 |
| MA13: Mean monthly flow, February | 1397.38 | 1497.10 | 7.14 |
| MA14: Mean monthly flow, March | 1724.85 | 1764.88 | 2.32 |
| MA15: Mean monthly flow, April | 1364.70 | 1206.62 | -11.58 |
| MA16: Mean monthly flow, May | 719.03 | 674.33 | -6.22 |
| MA17: Mean monthly flow, June | 649.72 | 679.90 | 4.64 |
| MA18: Mean monthly flow, July | 605.48 | 600.56 | -0.81 |
| MA19: Mean monthly flow, August | 527.85 | 550.16 | 4.23 |
| MA20: Mean monthly flow, September | 271.24 | 349.59 | 28.88 |
| MA21: Mean monthly flow, October | 381.28 | 359.33 | -5.76 |
| MA22: Mean monthly flow, November | 399.07 | 350.41 | -12.19 |
| MA23: Mean monthly flow, December | 912.66 | 965.65 | 5.81 |
| ML1: Mean minimum monthly flow, January | 861.91 | 761.11 | -11.70 |
| ML2: Mean minimum monthly flow, February | 878.73 | 855.41 | -2.65 |
| ML3: Mean minimum monthly flow, March | 926.36 | 896.05 | -3.27 |
| ML4: Mean minimum monthly flow, April | 546.82 | 474.60 | -13.21 |
| ML5: Mean minimum monthly flow, May | 306.00 | 295.20 | -3.53 |
| ML6: Mean minimum monthly flow, June | 200.41 | 229.01 | 14.27 |
| ML7: Mean minimum monthly flow, July | 283.57 | 306.46 | 8.07 |
| ML8: Mean minimum monthly flow, August | 209.45 | 208.29 | -0.55 |
| ML9: Mean minimum monthly flow, September | 128.82 | 66.13 | -48.66 |
| ML10: Mean minimum monthly flow, October | 182.82 | 129.81 | -28.99 |
| ML11: Mean minimum monthly flow, November | 250.91 | 184.46 | -26.48 |
| ML12: Mean minimum monthly flow, December | 462.91 | 375.24 | -18.94 |
| ML13: CV of minimum monthly flows | 111.39 | 132.69 | 19.12 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.21 | 0.10 | -51.52 |
| ML15: Mean minimum annual flow / mean annual flow | 0.12 | 0.05 | -58.54 |
| ML16: Median minimum annual flow / median annual flow | 0.16 | 0.04 | -72.23 |
| ML20: Ratio of baseflow volume to total flow volume | 0.57 | 0.53 | -7.46 |
| ML22: Mean annual minimum flow divided by catchment area | 1.03 | 0.38 | -62.71 |
| RA1: Mean of positive changes from one day to next (rise rate) | 161.93 | 206.26 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 263.65 | 321.45 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 104.68 | 91.98 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 250.35 | 227.58 |  |
| RA5: Ratio of days that are higher than previous day | 0.38 | 0.31 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.08 | 0.10 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.07 | 0.07 |  |
| RA8: Number of flow reversals from one day to the next | 60.92 | 57.75 |  |
| RA9: CV, number of flow reversals from one day to the next | 26.14 | 31.51 |  |

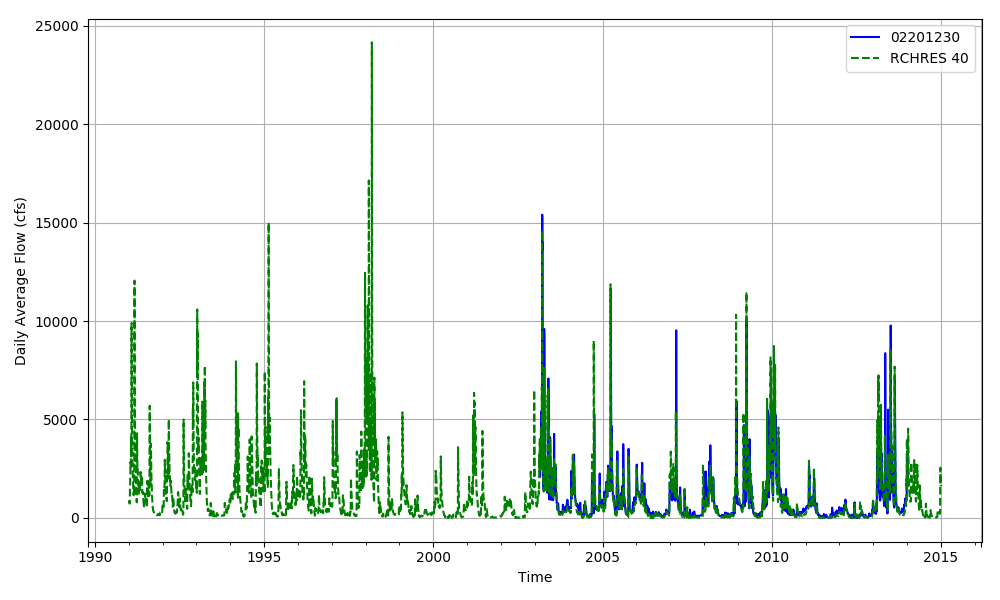


Figure 03060201-10: Daily flow for HSFP reach 40 and USGS station 02201230.

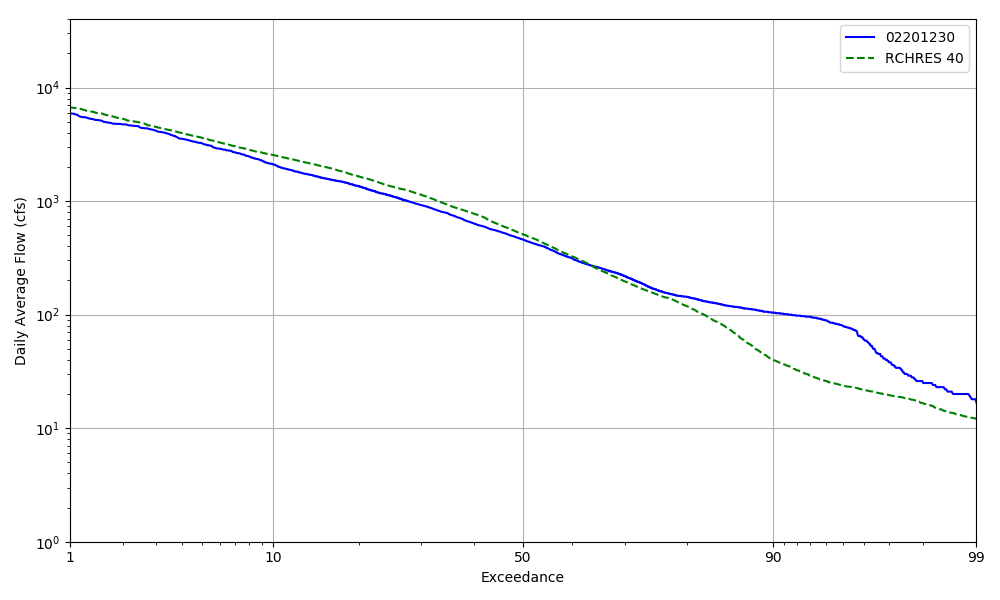


Figure 03060201-11: Daily exceedance for HSFP reach 40 and USGS station 02201230.

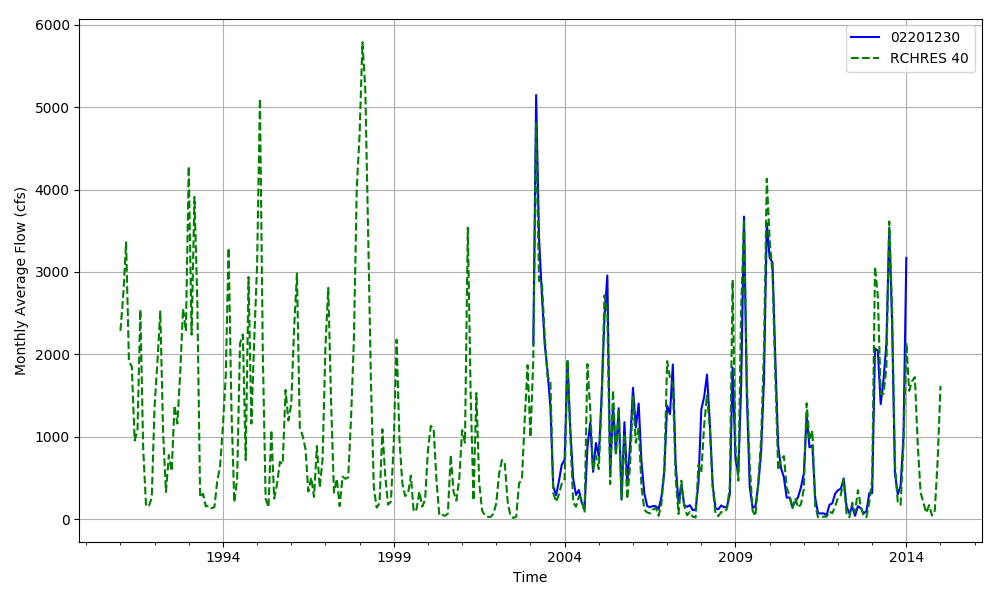


Figure 03060201-12: Monthly flow for HSFP reach 40 and USGS station 02201230.