# Appendix for Model 03110201

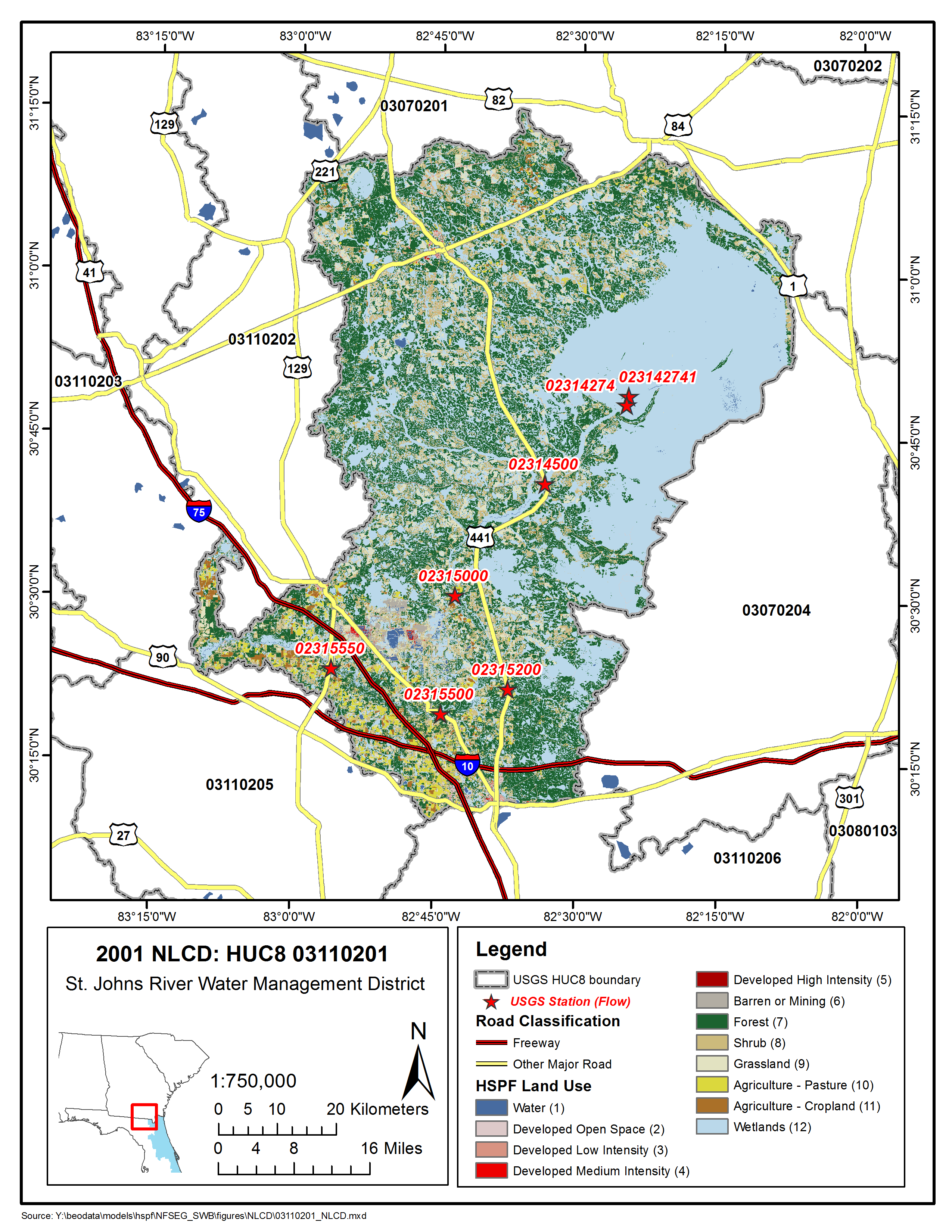


Figure 03110201-1: Land Cover from the National Land Cover Database.

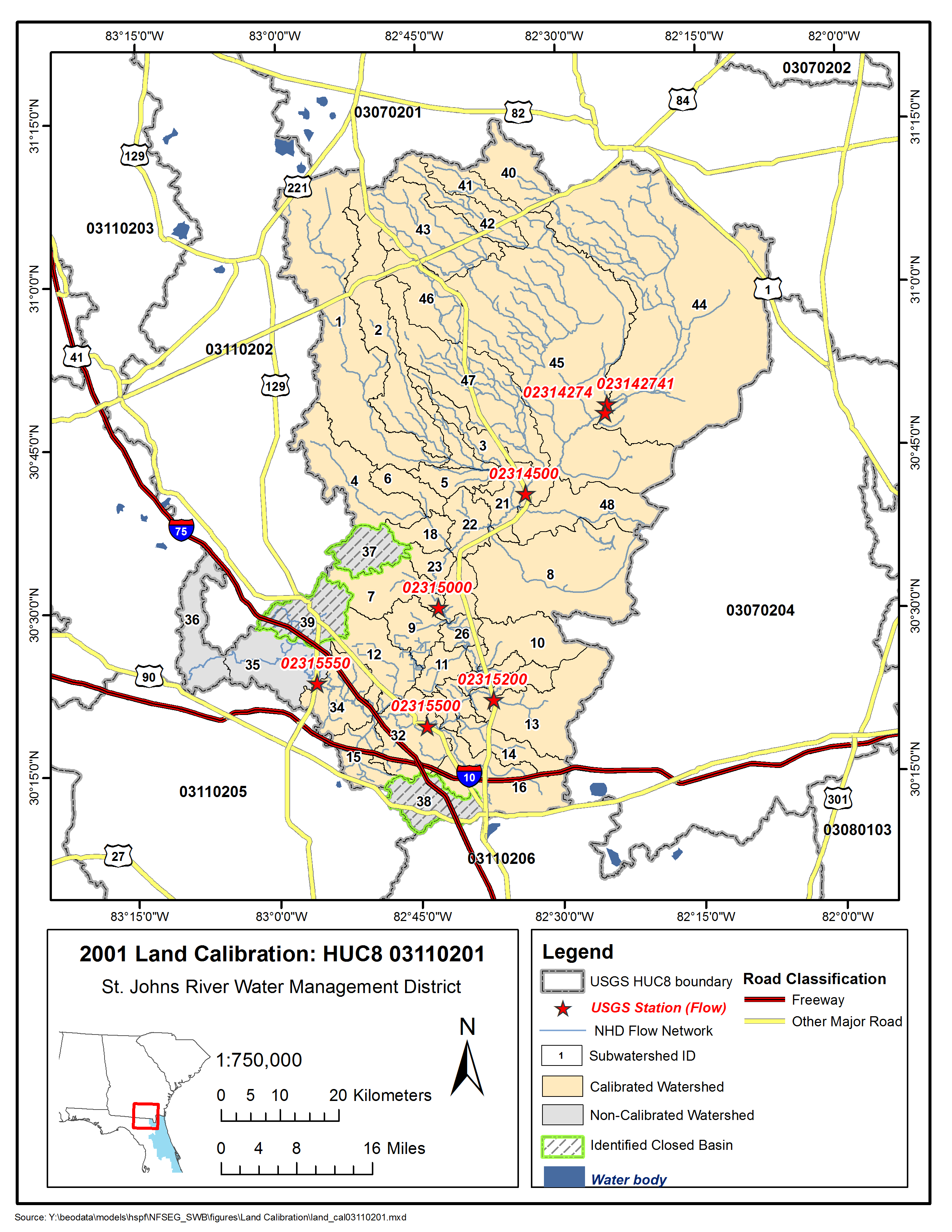


Figure 03110201-2: Calibrated sub-watersheds.

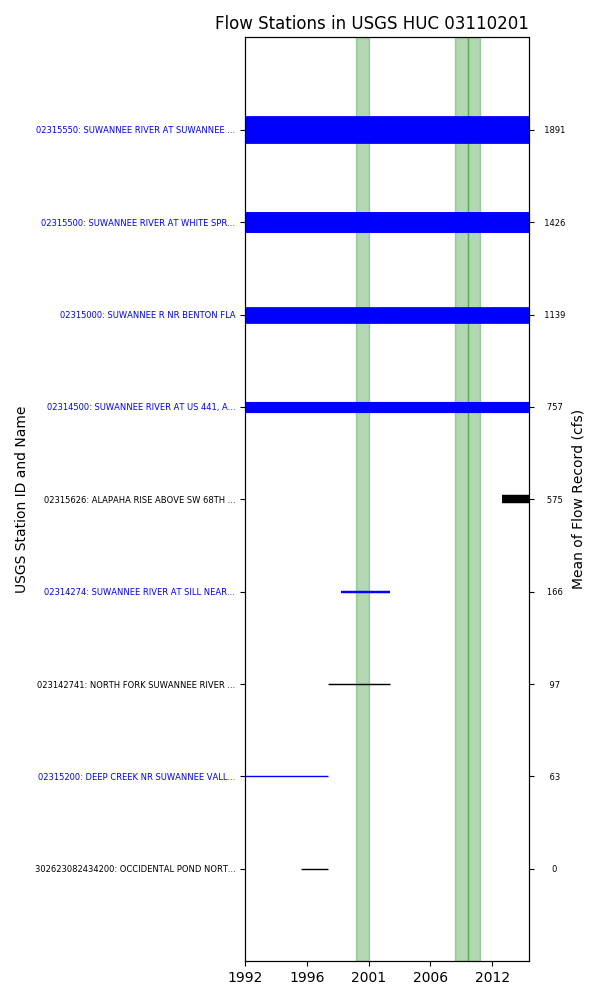


Figure 03110201-3: Station period of record. Blue color identifies gauges used for calibration.

## HSPF Reach 13, USGS Gauge 02315200

Table 03110201-1: Comparison Statistics Between HSPF Reach 13 and USGS Gauge 02315200.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | -6.38 |
| Standard error | 49.06 |
| Relative bias | -0.09 |
| Relative standard error | 0.49 |
| Nash-Sutcliffe coefficient | 0.76 |
| Kling-Gupta coefficient | 0.70 |
| Coefficient of efficiency | 0.60 |
| Index of agreement | 0.78 |

Table 03110201-2: Hydrologic Indices Between USGS Gauge 02315200 and HSPF Reach 13.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02315200 | Simulated Reach 13 | Percent Difference |
| MA1: Mean, all daily flows | 69.56 | 63.28 | -9.03 |
| MA2: Median, all daily flows | 25.00 | 33.75 | 35.02 |
| MA3: CV, all daily flows | 166.83 | 111.17 | -33.36 |
| MA4: CV, log of all daily flows | 138.58 | 114.52 | -17.36 |
| MA5: Mean daily flow / median daily flow | 2.78 | 1.87 | -32.62 |
| MA9: (Q10 - Q90) / median daily flow | 6.98 | 4.66 | -33.28 |
| MA10: (Q20 - Q80) / median daily flow | 3.68 | 3.03 | -17.58 |
| MA11: (Q25 - Q75) / median daily flow | 2.83 | 2.43 | -14.20 |
| MA12: Mean monthly flow, January | 92.88 | 102.28 | 10.11 |
| MA13: Mean monthly flow, February | 153.40 | 134.04 | -12.62 |
| MA14: Mean monthly flow, March | 127.60 | 130.86 | 2.55 |
| MA15: Mean monthly flow, April | 73.99 | 60.13 | -18.74 |
| MA16: Mean monthly flow, May | 30.77 | 20.85 | -32.23 |
| MA17: Mean monthly flow, June | 37.05 | 29.43 | -20.56 |
| MA18: Mean monthly flow, July | 37.13 | 39.73 | 7.01 |
| MA19: Mean monthly flow, August | 55.62 | 48.41 | -12.96 |
| MA20: Mean monthly flow, September | 34.33 | 33.29 | -3.02 |
| MA21: Mean monthly flow, October | 112.66 | 65.23 | -42.10 |
| MA22: Mean monthly flow, November | 26.82 | 32.34 | 20.57 |
| MA23: Mean monthly flow, December | 31.69 | 43.13 | 36.13 |
| ML1: Mean minimum monthly flow, January | 23.93 | 34.65 | 44.82 |
| ML2: Mean minimum monthly flow, February | 48.61 | 62.91 | 29.41 |
| ML3: Mean minimum monthly flow, March | 44.00 | 51.13 | 16.21 |
| ML4: Mean minimum monthly flow, April | 17.03 | 16.44 | -3.47 |
| ML5: Mean minimum monthly flow, May | 6.77 | 10.72 | 58.34 |
| ML6: Mean minimum monthly flow, June | 6.78 | 10.97 | 61.75 |
| ML7: Mean minimum monthly flow, July | 13.06 | 19.28 | 47.64 |
| ML8: Mean minimum monthly flow, August | 11.13 | 13.01 | 16.92 |
| ML9: Mean minimum monthly flow, September | 9.32 | 11.23 | 20.46 |
| ML10: Mean minimum monthly flow, October | 17.53 | 15.37 | -12.30 |
| ML11: Mean minimum monthly flow, November | 12.56 | 17.41 | 38.54 |
| ML12: Mean minimum monthly flow, December | 11.82 | 21.10 | 78.51 |
| ML13: CV of minimum monthly flows | 139.17 | 145.61 | 4.63 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.02 | 0.01 | -52.13 |
| ML15: Mean minimum annual flow / mean annual flow | 0.01 | 0.00 | -36.90 |
| ML16: Median minimum annual flow / median annual flow | 0.02 | 0.01 | -54.45 |
| ML20: Ratio of baseflow volume to total flow volume | 0.42 | 0.54 | 27.98 |
| ML22: Mean annual minimum flow divided by catchment area | 0.00 | 0.00 | -44.30 |
| RA1: Mean of positive changes from one day to next (rise rate) | 30.31 | 14.97 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 374.79 | 345.58 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 9.77 | 5.88 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 289.30 | 286.97 |  |
| RA5: Ratio of days that are higher than previous day | 0.23 | 0.29 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.22 | 0.16 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.10 | 0.09 |  |
| RA8: Number of flow reversals from one day to the next | 69.12 | 67.50 |  |
| RA9: CV, number of flow reversals from one day to the next | 8.38 | 16.38 |  |

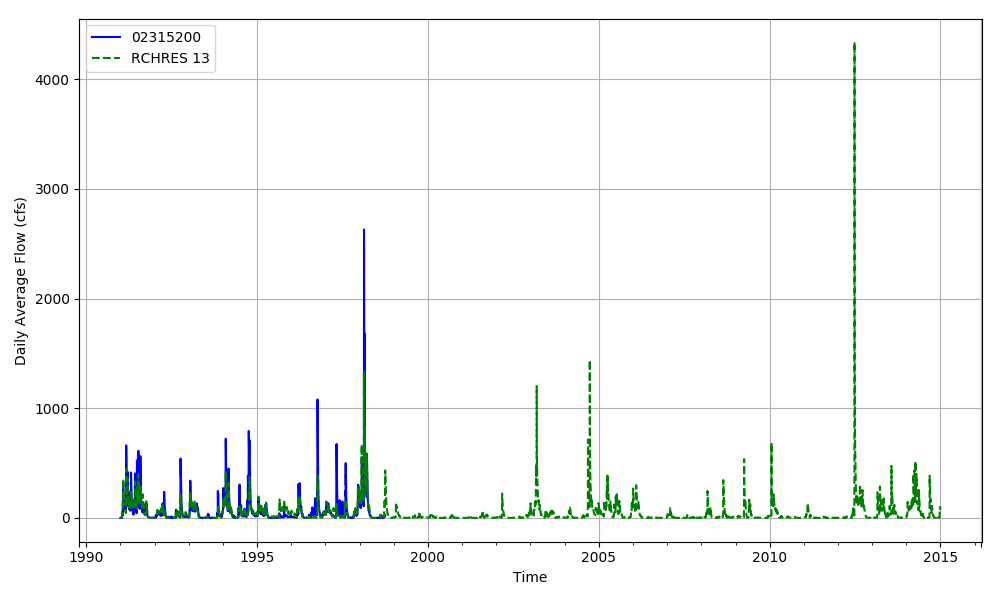


Figure 03110201-4: Daily flow for HSFP reach 13 and USGS station 02315200.

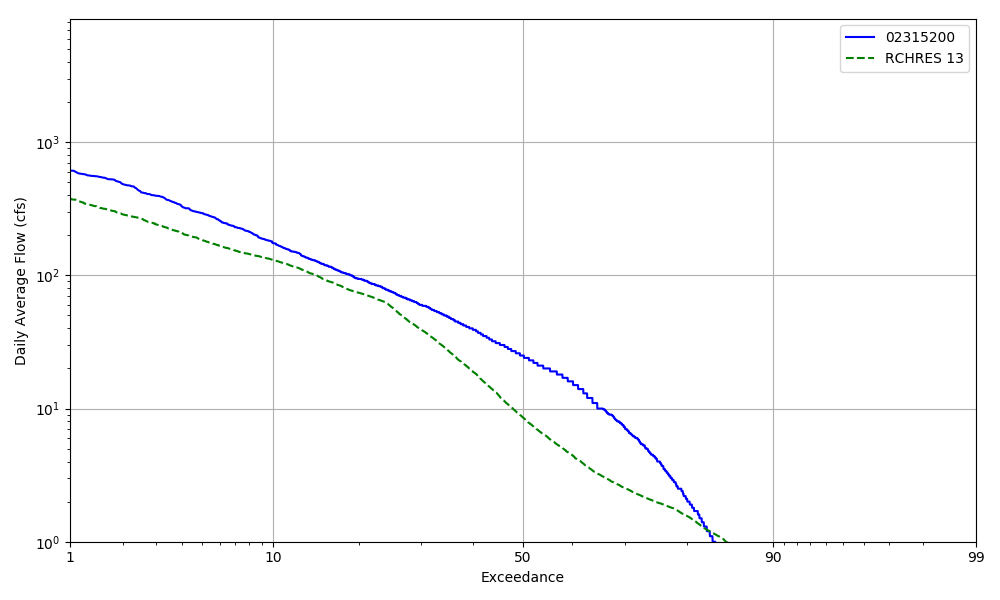


Figure 03110201-5: Daily exceedance for HSFP reach 13 and USGS station 02315200.

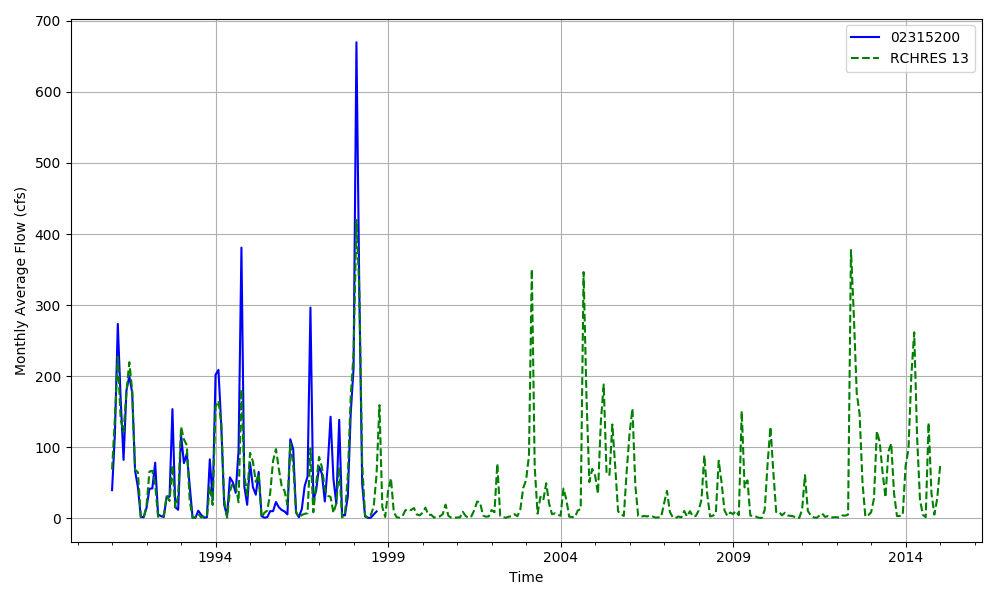


Figure 03110201-6: Monthly flow for HSFP reach 13 and USGS station 02315200.

## HSPF Reach 24, USGS Gauge 02315000

Table 03110201-3: Comparison Statistics Between HSPF Reach 24 and USGS Gauge 02315000.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | -36.86 |
| Standard error | 580.29 |
| Relative bias | -0.03 |
| Relative standard error | 0.32 |
| Nash-Sutcliffe coefficient | 0.90 |
| Kling-Gupta coefficient | 0.85 |
| Coefficient of efficiency | 0.72 |
| Index of agreement | 0.85 |

Table 03110201-4: Hydrologic Indices Between USGS Gauge 02315000 and HSPF Reach 24.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02315000 | Simulated Reach 24 | Percent Difference |
| MA1: Mean, all daily flows | 1305.58 | 1331.05 | 1.95 |
| MA2: Median, all daily flows | 484.50 | 621.64 | 28.31 |
| MA3: CV, all daily flows | 72.08 | 64.05 | -11.13 |
| MA4: CV, log of all daily flows | 132.00 | 117.32 | -11.12 |
| MA5: Mean daily flow / median daily flow | 2.69 | 2.14 | -20.54 |
| MA9: (Q10 - Q90) / median daily flow | 7.12 | 5.63 | -21.00 |
| MA10: (Q20 - Q80) / median daily flow | 4.38 | 3.29 | -24.93 |
| MA11: (Q25 - Q75) / median daily flow | 3.29 | 2.59 | -21.40 |
| MA12: Mean monthly flow, January | 936.96 | 1178.70 | 25.80 |
| MA13: Mean monthly flow, February | 2127.11 | 2057.22 | -3.29 |
| MA14: Mean monthly flow, March | 2180.32 | 2038.53 | -6.50 |
| MA15: Mean monthly flow, April | 1112.86 | 1111.83 | -0.09 |
| MA16: Mean monthly flow, May | 288.91 | 366.53 | 26.86 |
| MA17: Mean monthly flow, June | 331.23 | 281.40 | -15.04 |
| MA18: Mean monthly flow, July | 424.49 | 471.68 | 11.12 |
| MA19: Mean monthly flow, August | 768.89 | 743.86 | -3.26 |
| MA20: Mean monthly flow, September | 380.67 | 520.07 | 36.62 |
| MA21: Mean monthly flow, October | 767.74 | 753.27 | -1.89 |
| MA22: Mean monthly flow, November | 481.48 | 473.61 | -1.63 |
| MA23: Mean monthly flow, December | 555.77 | 558.03 | 0.41 |
| ML1: Mean minimum monthly flow, January | 685.50 | 797.11 | 16.28 |
| ML2: Mean minimum monthly flow, February | 2073.33 | 1946.14 | -6.13 |
| ML3: Mean minimum monthly flow, March | 1976.92 | 1800.16 | -8.94 |
| ML4: Mean minimum monthly flow, April | 755.67 | 877.94 | 16.18 |
| ML5: Mean minimum monthly flow, May | 188.83 | 259.85 | 37.61 |
| ML6: Mean minimum monthly flow, June | 231.18 | 241.10 | 4.30 |
| ML7: Mean minimum monthly flow, July | 418.27 | 432.46 | 3.39 |
| ML8: Mean minimum monthly flow, August | 540.83 | 610.64 | 12.91 |
| ML9: Mean minimum monthly flow, September | 252.75 | 425.56 | 68.37 |
| ML10: Mean minimum monthly flow, October | 269.17 | 433.29 | 60.97 |
| ML11: Mean minimum monthly flow, November | 406.45 | 465.22 | 14.46 |
| ML12: Mean minimum monthly flow, December | 608.82 | 575.98 | -5.39 |
| ML13: CV of minimum monthly flows | 170.03 | 144.87 | -14.80 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.12 | 0.09 | -25.50 |
| ML15: Mean minimum annual flow / mean annual flow | 0.07 | 0.07 | -3.90 |
| ML16: Median minimum annual flow / median annual flow | 0.05 | 0.03 | -34.63 |
| ML20: Ratio of baseflow volume to total flow volume | 0.73 | 0.75 | 2.78 |
| ML22: Mean annual minimum flow divided by catchment area | 27778.05 | 27778.22 | 0.00 |
| RA1: Mean of positive changes from one day to next (rise rate) | 103.42 | 108.98 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 221.90 | 232.40 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 53.61 | 53.21 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 154.96 | 149.70 |  |
| RA5: Ratio of days that are higher than previous day | 0.32 | 0.33 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.05 | 0.06 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.04 | 0.04 |  |
| RA8: Number of flow reversals from one day to the next | 35.61 | 29.22 |  |
| RA9: CV, number of flow reversals from one day to the next | 77.05 | 74.09 |  |

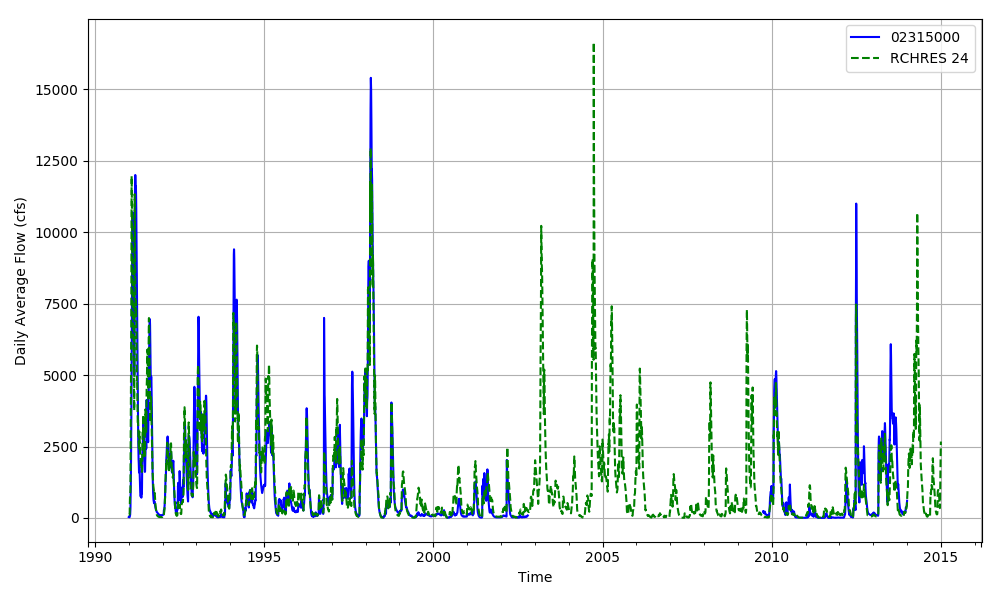


Figure 03110201-7: Daily flow for HSFP reach 24 and USGS station 02315000.

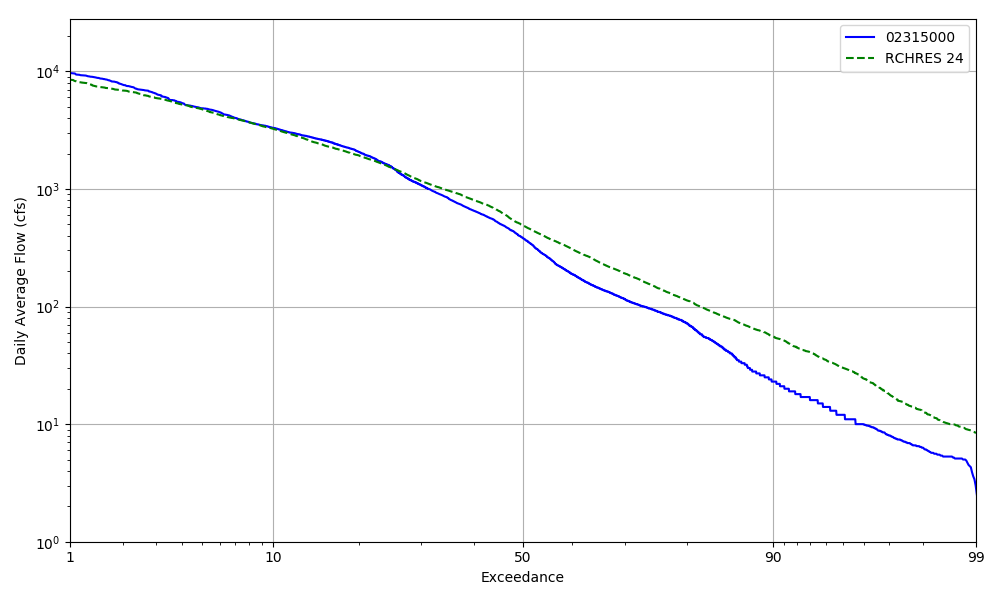


Figure 03110201-8: Daily exceedance for HSFP reach 24 and USGS station 02315000.

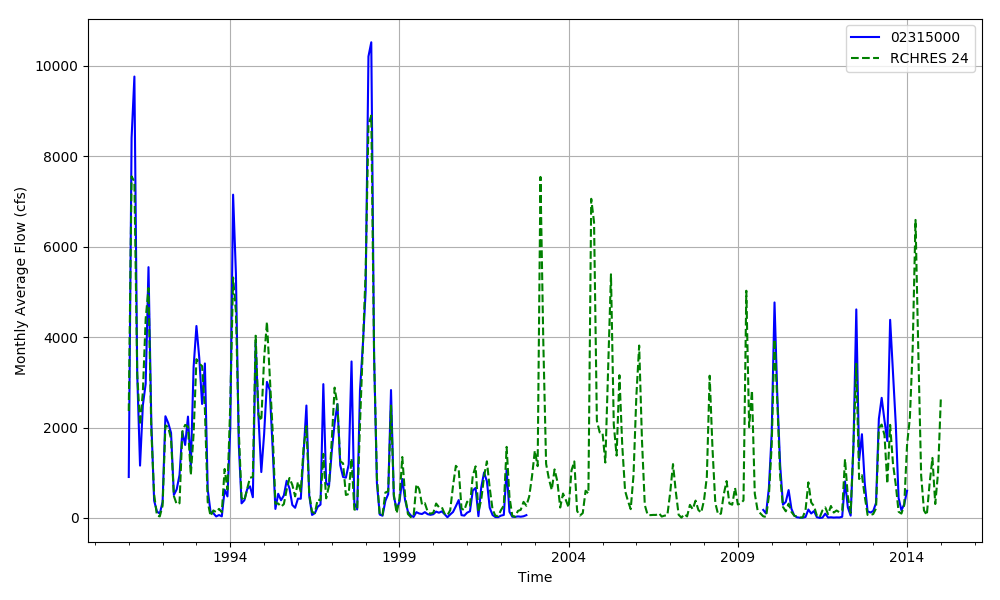


Figure 03110201-9: Monthly flow for HSFP reach 24 and USGS station 02315000.

## HSPF Reach 31, USGS Gauge 02315500

Table 03110201-5: Comparison Statistics Between HSPF Reach 31 and USGS Gauge 02315500.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | -41.89 |
| Standard error | 737.62 |
| Relative bias | -0.03 |
| Relative standard error | 0.32 |
| Nash-Sutcliffe coefficient | 0.90 |
| Kling-Gupta coefficient | 0.82 |
| Coefficient of efficiency | 0.73 |
| Index of agreement | 0.85 |

Table 03110201-6: Hydrologic Indices Between USGS Gauge 02315500 and HSPF Reach 31.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02315500 | Simulated Reach 31 | Percent Difference |
| MA1: Mean, all daily flows | 1465.20 | 1422.40 | -2.92 |
| MA2: Median, all daily flows | 492.00 | 606.63 | 23.30 |
| MA3: CV, all daily flows | 119.85 | 104.62 | -12.71 |
| MA4: CV, log of all daily flows | 138.19 | 120.64 | -12.70 |
| MA5: Mean daily flow / median daily flow | 2.98 | 2.34 | -21.26 |
| MA9: (Q10 - Q90) / median daily flow | 7.92 | 6.12 | -22.72 |
| MA10: (Q20 - Q80) / median daily flow | 4.42 | 3.48 | -21.30 |
| MA11: (Q25 - Q75) / median daily flow | 3.08 | 2.66 | -13.61 |
| MA12: Mean monthly flow, January | 1160.62 | 1556.48 | 34.11 |
| MA13: Mean monthly flow, February | 2475.91 | 2568.04 | 3.72 |
| MA14: Mean monthly flow, March | 3148.23 | 3025.33 | -3.90 |
| MA15: Mean monthly flow, April | 2164.66 | 1974.12 | -8.80 |
| MA16: Mean monthly flow, May | 643.04 | 723.60 | 12.53 |
| MA17: Mean monthly flow, June | 882.23 | 734.28 | -16.77 |
| MA18: Mean monthly flow, July | 1309.68 | 1078.69 | -17.64 |
| MA19: Mean monthly flow, August | 1279.02 | 1089.61 | -14.81 |
| MA20: Mean monthly flow, September | 1160.84 | 1089.20 | -6.17 |
| MA21: Mean monthly flow, October | 1476.72 | 1191.97 | -19.28 |
| MA22: Mean monthly flow, November | 612.07 | 639.43 | 4.47 |
| MA23: Mean monthly flow, December | 645.82 | 804.64 | 24.59 |
| ML1: Mean minimum monthly flow, January | 577.96 | 765.55 | 32.46 |
| ML2: Mean minimum monthly flow, February | 1668.66 | 1629.43 | -2.35 |
| ML3: Mean minimum monthly flow, March | 1868.96 | 1783.73 | -4.56 |
| ML4: Mean minimum monthly flow, April | 1003.17 | 998.72 | -0.44 |
| ML5: Mean minimum monthly flow, May | 260.85 | 364.07 | 39.57 |
| ML6: Mean minimum monthly flow, June | 312.30 | 336.05 | 7.60 |
| ML7: Mean minimum monthly flow, July | 670.59 | 619.76 | -7.58 |
| ML8: Mean minimum monthly flow, August | 730.17 | 640.17 | -12.33 |
| ML9: Mean minimum monthly flow, September | 426.84 | 454.50 | 6.48 |
| ML10: Mean minimum monthly flow, October | 550.73 | 498.89 | -9.41 |
| ML11: Mean minimum monthly flow, November | 343.07 | 402.07 | 17.20 |
| ML12: Mean minimum monthly flow, December | 415.10 | 477.99 | 15.15 |
| ML13: CV of minimum monthly flows | 180.18 | 147.77 | -17.98 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.12 | 0.10 | -15.06 |
| ML15: Mean minimum annual flow / mean annual flow | 0.06 | 0.06 | -3.68 |
| ML16: Median minimum annual flow / median annual flow | 0.07 | 0.08 | 16.20 |
| ML20: Ratio of baseflow volume to total flow volume | 0.72 | 0.73 | 1.39 |
| ML22: Mean annual minimum flow divided by catchment area | 0.72 | 0.66 | -8.23 |
| RA1: Mean of positive changes from one day to next (rise rate) | 138.03 | 129.16 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 342.95 | 340.59 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 64.86 | 61.37 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 192.52 | 194.17 |  |
| RA5: Ratio of days that are higher than previous day | 0.30 | 0.32 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.06 | 0.06 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.05 | 0.05 |  |
| RA8: Number of flow reversals from one day to the next | 57.50 | 48.38 |  |
| RA9: CV, number of flow reversals from one day to the next | 22.62 | 22.04 |  |

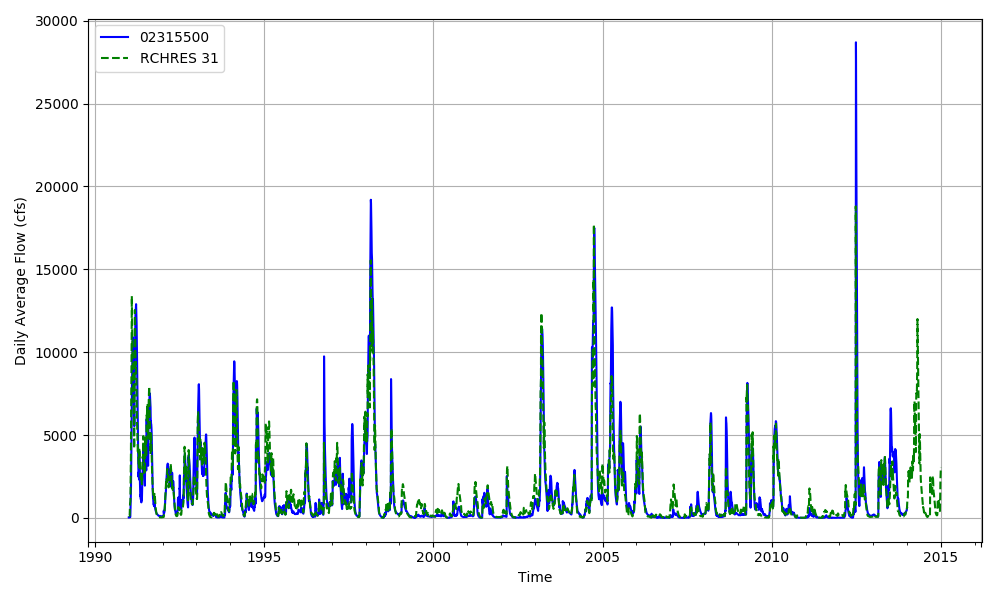


Figure 03110201-10: Daily flow for HSFP reach 31 and USGS station 02315500.

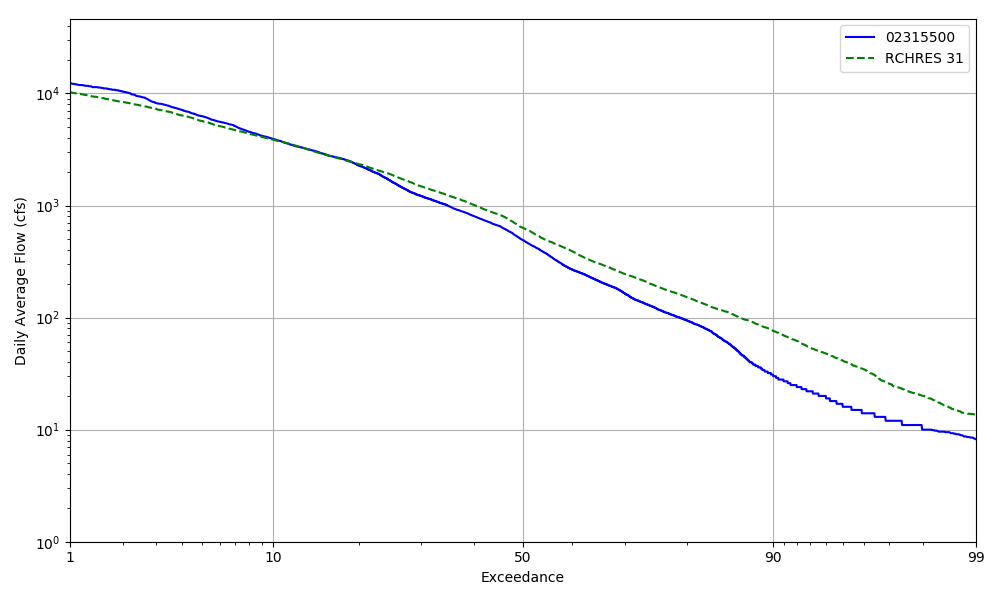


Figure 03110201-11: Daily exceedance for HSFP reach 31 and USGS station 02315500.

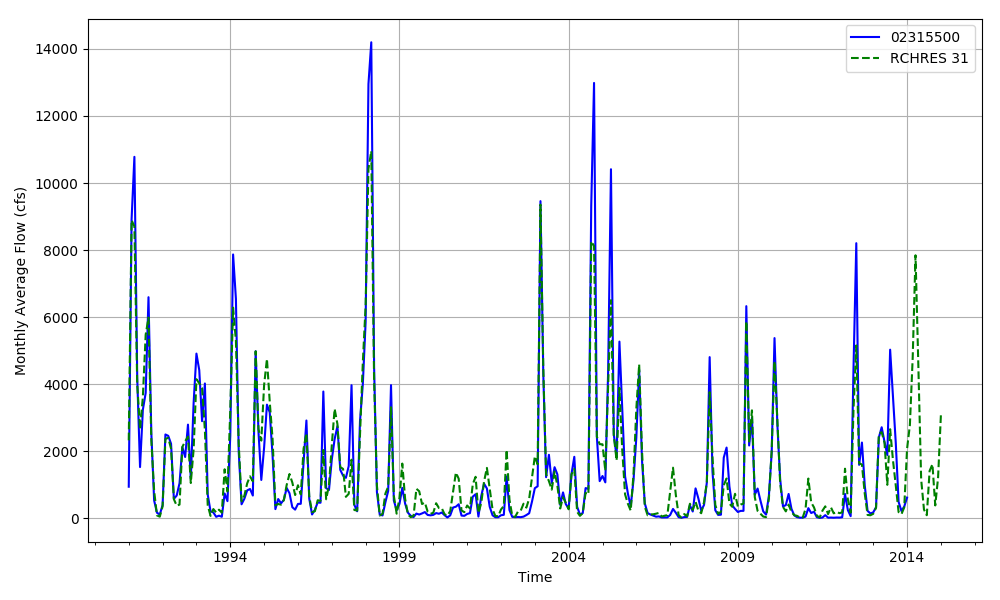


Figure 03110201-12: Monthly flow for HSFP reach 31 and USGS station 02315500.

## HSPF Reach 34, USGS Gauge 02315550

Table 03110201-7: Comparison Statistics Between HSPF Reach 34 and USGS Gauge 02315550.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | 20.71 |
| Standard error | 710.37 |
| Relative bias | 0.01 |
| Relative standard error | 0.34 |
| Nash-Sutcliffe coefficient | 0.88 |
| Kling-Gupta coefficient | 0.94 |
| Coefficient of efficiency | 0.69 |
| Index of agreement | 0.84 |

Table 03110201-8: Hydrologic Indices Between USGS Gauge 02315550 and HSPF Reach 34.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02315550 | Simulated Reach 34 | Percent Difference |
| MA1: Mean, all daily flows | 2111.18 | 2280.98 | 8.04 |
| MA2: Median, all daily flows | 1150.00 | 1480.33 | 28.72 |
| MA3: CV, all daily flows | 57.49 | 54.42 | -5.33 |
| MA4: CV, log of all daily flows | 97.50 | 92.86 | -4.76 |
| MA5: Mean daily flow / median daily flow | 1.84 | 1.54 | -16.07 |
| MA9: (Q10 - Q90) / median daily flow | 4.16 | 3.46 | -16.72 |
| MA10: (Q20 - Q80) / median daily flow | 2.64 | 2.41 | -8.55 |
| MA11: (Q25 - Q75) / median daily flow | 2.23 | 1.92 | -13.85 |
| MA12: Mean monthly flow, January | 1266.91 | 1789.24 | 41.23 |
| MA13: Mean monthly flow, February | 2986.70 | 3274.17 | 9.63 |
| MA14: Mean monthly flow, March | 3068.28 | 3136.88 | 2.24 |
| MA15: Mean monthly flow, April | 2130.03 | 1984.21 | -6.85 |
| MA16: Mean monthly flow, May | 654.81 | 675.46 | 3.15 |
| MA17: Mean monthly flow, June | 772.51 | 694.35 | -10.12 |
| MA18: Mean monthly flow, July | 880.39 | 1022.52 | 16.14 |
| MA19: Mean monthly flow, August | 1305.66 | 1343.04 | 2.86 |
| MA20: Mean monthly flow, September | 872.01 | 961.72 | 10.29 |
| MA21: Mean monthly flow, October | 1063.99 | 1210.79 | 13.80 |
| MA22: Mean monthly flow, November | 644.93 | 804.37 | 24.72 |
| MA23: Mean monthly flow, December | 664.84 | 720.03 | 8.30 |
| ML1: Mean minimum monthly flow, January | 765.50 | 994.52 | 29.92 |
| ML2: Mean minimum monthly flow, February | 3129.83 | 3123.97 | -0.19 |
| ML3: Mean minimum monthly flow, March | 3067.17 | 2815.46 | -8.21 |
| ML4: Mean minimum monthly flow, April | 1828.00 | 1730.74 | -5.32 |
| ML5: Mean minimum monthly flow, May | 535.50 | 558.73 | 4.34 |
| ML6: Mean minimum monthly flow, June | 697.67 | 625.34 | -10.37 |
| ML7: Mean minimum monthly flow, July | 939.33 | 1038.55 | 10.56 |
| ML8: Mean minimum monthly flow, August | 1394.50 | 1148.19 | -17.66 |
| ML9: Mean minimum monthly flow, September | 608.67 | 813.63 | 33.67 |
| ML10: Mean minimum monthly flow, October | 574.20 | 873.98 | 52.21 |
| ML11: Mean minimum monthly flow, November | 673.20 | 876.42 | 30.19 |
| ML12: Mean minimum monthly flow, December | 823.60 | 920.60 | 11.78 |
| ML13: CV of minimum monthly flows | 114.83 | 102.34 | -10.88 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.11 | 0.05 | -49.20 |
| ML15: Mean minimum annual flow / mean annual flow | 0.07 | 0.04 | -43.31 |
| ML16: Median minimum annual flow / median annual flow | 0.09 | 0.06 | -40.85 |
| ML20: Ratio of baseflow volume to total flow volume | 0.77 | 0.73 | -5.51 |
| ML22: Mean annual minimum flow divided by catchment area | 33334.54 | 33334.14 | -0.00 |
| RA1: Mean of positive changes from one day to next (rise rate) | 143.00 | 161.26 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 159.01 | 143.49 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 74.92 | 85.87 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 119.51 | 118.05 |  |
| RA5: Ratio of days that are higher than previous day | 0.34 | 0.35 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.04 | 0.06 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.04 | 0.04 |  |
| RA8: Number of flow reversals from one day to the next | 36.67 | 28.56 |  |
| RA9: CV, number of flow reversals from one day to the next | 78.35 | 78.21 |  |

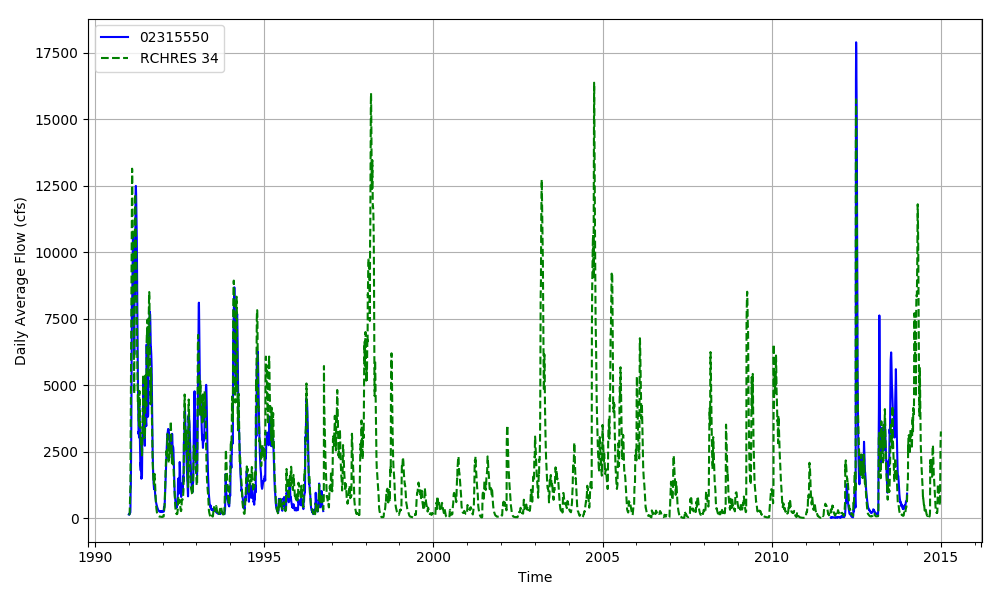


Figure 03110201-13: Daily flow for HSFP reach 34 and USGS station 02315550.

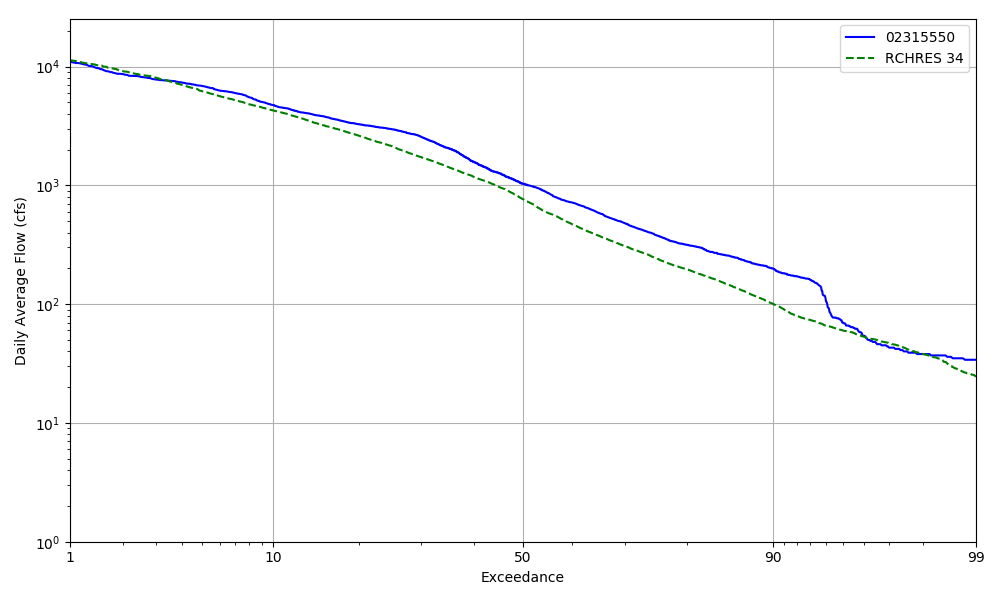


Figure 03110201-14: Daily exceedance for HSFP reach 34 and USGS station 02315550.

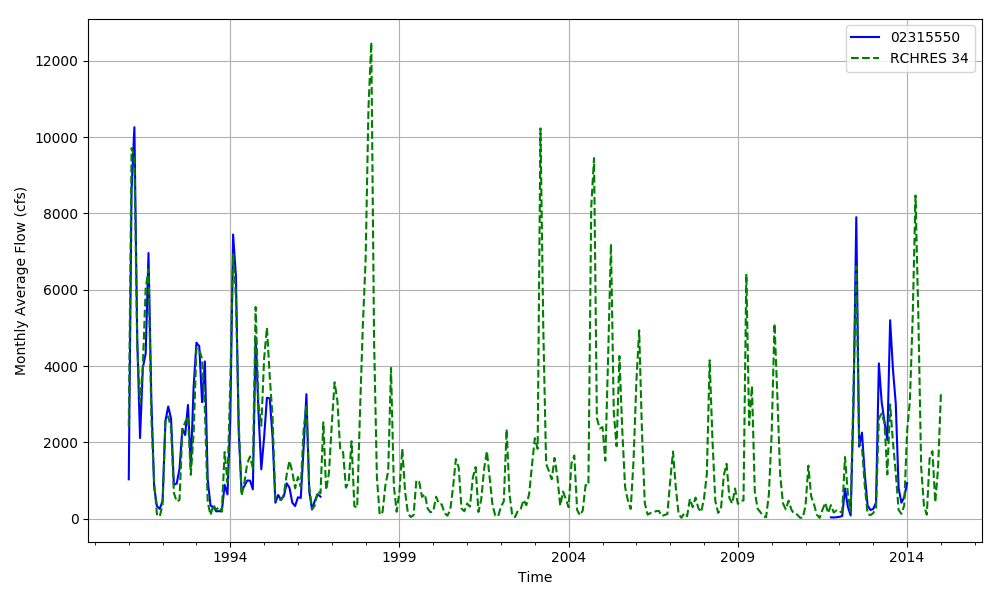


Figure 03110201-15: Monthly flow for HSFP reach 34 and USGS station 02315550.

## HSPF Reach 44, USGS Gauge 0231427S

Table 03110201-9: Comparison Statistics Between HSPF Reach 44 and USGS Gauge 0231427S.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | -1.06 |
| Standard error | 108.52 |
| Relative bias | -0.01 |
| Relative standard error | 0.52 |
| Nash-Sutcliffe coefficient | 0.73 |
| Kling-Gupta coefficient | 0.86 |
| Coefficient of efficiency | 0.49 |
| Index of agreement | 0.75 |

Table 03110201-10: Hydrologic Indices Between USGS Gauge 0231427S and HSPF Reach 44.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 0231427S | Simulated Reach 44 | Percent Difference |
| MA1: Mean, all daily flows | 136.12 | 134.84 | -0.94 |
| MA2: Median, all daily flows | 64.00 | 48.22 | -24.65 |
| MA3: CV, all daily flows | 119.73 | 149.12 | 24.55 |
| MA4: CV, log of all daily flows | 129.78 | 130.00 | 0.17 |
| MA5: Mean daily flow / median daily flow | 2.13 | 2.80 | 31.46 |
| MA9: (Q10 - Q90) / median daily flow | 5.21 | 6.82 | 30.94 |
| MA10: (Q20 - Q80) / median daily flow | 2.09 | 3.23 | 54.50 |
| MA11: (Q25 - Q75) / median daily flow | 1.39 | 2.07 | 48.91 |
| MA12: Mean monthly flow, January | 78.86 | 96.90 | 22.88 |
| MA13: Mean monthly flow, February | 96.55 | 137.47 | 42.38 |
| MA14: Mean monthly flow, March | 444.70 | 436.40 | -1.87 |
| MA15: Mean monthly flow, April | 230.99 | 159.13 | -31.11 |
| MA16: Mean monthly flow, May | 101.32 | 24.41 | -75.91 |
| MA17: Mean monthly flow, June | 36.66 | 32.58 | -11.11 |
| MA18: Mean monthly flow, July | 102.47 | 95.07 | -7.23 |
| MA19: Mean monthly flow, August | 195.36 | 179.13 | -8.31 |
| MA20: Mean monthly flow, September | 135.94 | 153.68 | 13.06 |
| MA21: Mean monthly flow, October | 108.35 | 194.21 | 79.25 |
| MA22: Mean monthly flow, November | 39.91 | 41.03 | 2.81 |
| MA23: Mean monthly flow, December | 55.57 | 63.92 | 15.03 |
| ML1: Mean minimum monthly flow, January | 45.64 | 32.40 | -29.02 |
| ML2: Mean minimum monthly flow, February | 63.20 | 55.38 | -12.37 |
| ML3: Mean minimum monthly flow, March | 150.40 | 130.87 | -12.98 |
| ML4: Mean minimum monthly flow, April | 135.88 | 48.90 | -64.01 |
| ML5: Mean minimum monthly flow, May | 25.10 | 12.57 | -49.93 |
| ML6: Mean minimum monthly flow, June | 4.70 | 8.20 | 74.44 |
| ML7: Mean minimum monthly flow, July | 49.33 | 40.15 | -18.60 |
| ML8: Mean minimum monthly flow, August | 52.42 | 49.29 | -5.96 |
| ML9: Mean minimum monthly flow, September | 52.38 | 40.58 | -22.52 |
| ML10: Mean minimum monthly flow, October | 54.21 | 49.83 | -8.08 |
| ML11: Mean minimum monthly flow, November | 26.77 | 20.97 | -21.66 |
| ML12: Mean minimum monthly flow, December | 29.05 | 29.48 | 1.51 |
| ML13: CV of minimum monthly flows | 157.40 | 174.36 | 10.77 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.10 | 0.10 | 0.39 |
| ML15: Mean minimum annual flow / mean annual flow | 0.04 | 0.04 | -7.84 |
| ML16: Median minimum annual flow / median annual flow | 0.04 | 0.04 | -5.88 |
| ML20: Ratio of baseflow volume to total flow volume | 0.52 | 0.58 | 13.27 |
| ML22: Mean annual minimum flow divided by catchment area | 0.04 | 0.08 | 118.60 |
| RA1: Mean of positive changes from one day to next (rise rate) | 15.78 | 18.01 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 206.59 | 239.23 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 8.49 | 9.68 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 195.01 | 168.54 |  |
| RA5: Ratio of days that are higher than previous day | 0.29 | 0.33 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.05 | 0.08 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.05 | 0.07 |  |
| RA8: Number of flow reversals from one day to the next | 49.00 | 75.60 |  |
| RA9: CV, number of flow reversals from one day to the next | 30.10 | 16.16 |  |

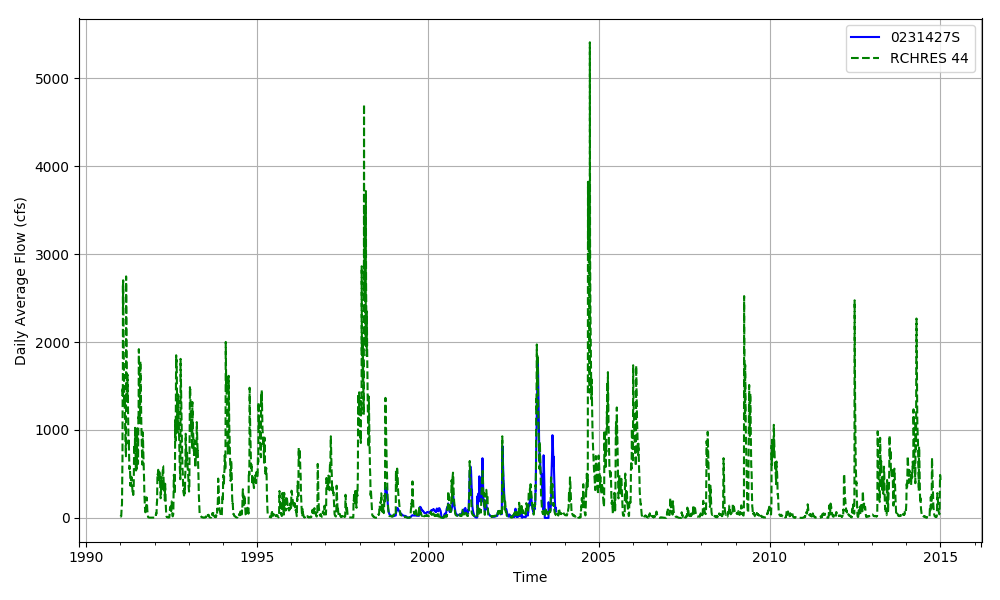


Figure 03110201-16: Daily flow for HSFP reach 44 and USGS station 0231427S.

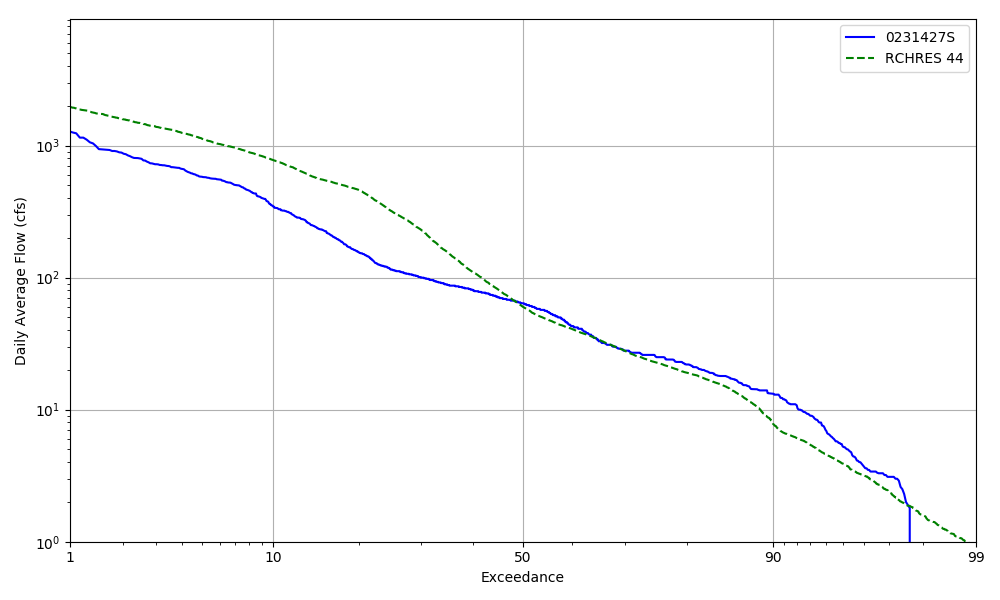


Figure 03110201-17: Daily exceedance for HSFP reach 44 and USGS station 0231427S.

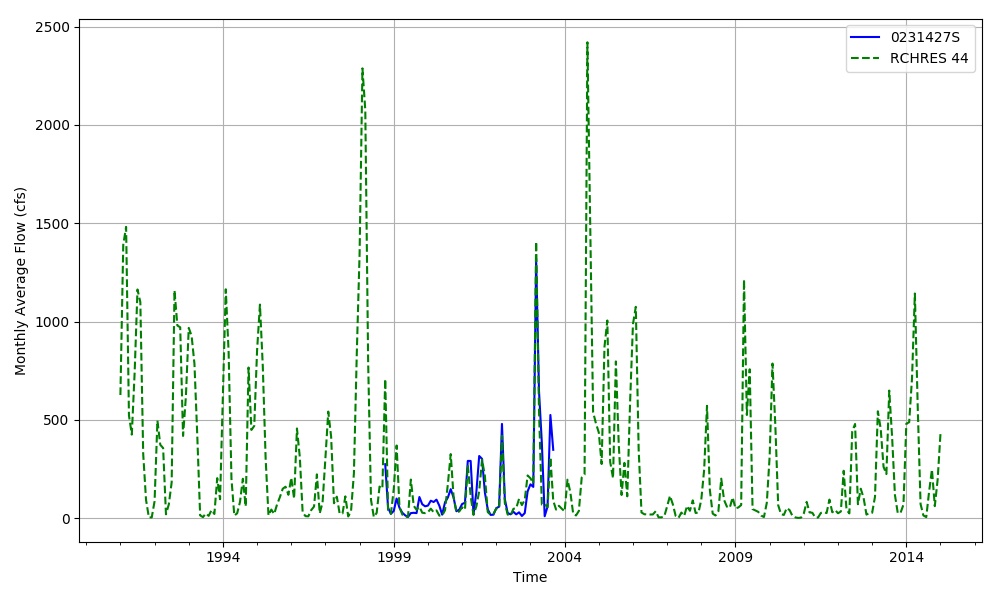


Figure 03110201-18: Monthly flow for HSFP reach 44 and USGS station 0231427S.

## HSPF Reach 45, USGS Gauge 02314500

Table 03110201-11: Comparison Statistics Between HSPF Reach 45 and USGS Gauge 02314500.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | -158.66 |
| Standard error | 473.03 |
| Relative bias | -0.20 |
| Relative standard error | 0.41 |
| Nash-Sutcliffe coefficient | 0.83 |
| Kling-Gupta coefficient | 0.68 |
| Coefficient of efficiency | 0.66 |
| Index of agreement | 0.82 |

Table 03110201-12: Hydrologic Indices Between USGS Gauge 02314500 and HSPF Reach 45.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02314500 | Simulated Reach 45 | Percent Difference |
| MA1: Mean, all daily flows | 781.80 | 622.87 | -20.33 |
| MA2: Median, all daily flows | 267.00 | 223.83 | -16.17 |
| MA3: CV, all daily flows | 108.96 | 109.95 | 0.91 |
| MA4: CV, log of all daily flows | 130.93 | 129.01 | -1.47 |
| MA5: Mean daily flow / median daily flow | 2.93 | 2.78 | -4.96 |
| MA9: (Q10 - Q90) / median daily flow | 8.17 | 7.74 | -5.28 |
| MA10: (Q20 - Q80) / median daily flow | 4.71 | 3.76 | -20.23 |
| MA11: (Q25 - Q75) / median daily flow | 3.24 | 3.04 | -6.23 |
| MA12: Mean monthly flow, January | 662.72 | 732.72 | 10.56 |
| MA13: Mean monthly flow, February | 1354.41 | 1193.76 | -11.86 |
| MA14: Mean monthly flow, March | 1639.71 | 1367.20 | -16.62 |
| MA15: Mean monthly flow, April | 1090.87 | 867.90 | -20.44 |
| MA16: Mean monthly flow, May | 352.96 | 295.91 | -16.16 |
| MA17: Mean monthly flow, June | 418.22 | 281.16 | -32.77 |
| MA18: Mean monthly flow, July | 558.94 | 423.53 | -24.22 |
| MA19: Mean monthly flow, August | 706.84 | 458.66 | -35.11 |
| MA20: Mean monthly flow, September | 680.99 | 485.98 | -28.64 |
| MA21: Mean monthly flow, October | 772.12 | 479.26 | -37.93 |
| MA22: Mean monthly flow, November | 389.99 | 268.10 | -31.26 |
| MA23: Mean monthly flow, December | 425.99 | 368.34 | -13.53 |
| ML1: Mean minimum monthly flow, January | 352.26 | 353.66 | 0.40 |
| ML2: Mean minimum monthly flow, February | 885.13 | 745.40 | -15.79 |
| ML3: Mean minimum monthly flow, March | 960.09 | 732.33 | -23.72 |
| ML4: Mean minimum monthly flow, April | 541.72 | 432.73 | -20.12 |
| ML5: Mean minimum monthly flow, May | 144.96 | 148.06 | 2.14 |
| ML6: Mean minimum monthly flow, June | 181.89 | 142.46 | -21.68 |
| ML7: Mean minimum monthly flow, July | 342.02 | 221.04 | -35.37 |
| ML8: Mean minimum monthly flow, August | 386.53 | 260.51 | -32.60 |
| ML9: Mean minimum monthly flow, September | 253.43 | 173.02 | -31.73 |
| ML10: Mean minimum monthly flow, October | 299.09 | 202.48 | -32.30 |
| ML11: Mean minimum monthly flow, November | 232.77 | 178.66 | -23.24 |
| ML12: Mean minimum monthly flow, December | 285.26 | 221.36 | -22.40 |
| ML13: CV of minimum monthly flows | 159.14 | 153.68 | -3.43 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.10 | 0.09 | -12.44 |
| ML15: Mean minimum annual flow / mean annual flow | 0.06 | 0.05 | -19.26 |
| ML16: Median minimum annual flow / median annual flow | 0.07 | 0.05 | -26.82 |
| ML20: Ratio of baseflow volume to total flow volume | 0.67 | 0.70 | 3.97 |
| ML22: Mean annual minimum flow divided by catchment area | 0.44 | 0.23 | -47.61 |
| RA1: Mean of positive changes from one day to next (rise rate) | 67.16 | 59.28 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 202.11 | 337.80 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 31.58 | 28.24 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 156.02 | 193.21 |  |
| RA5: Ratio of days that are higher than previous day | 0.30 | 0.32 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.06 | 0.06 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.04 | 0.05 |  |
| RA8: Number of flow reversals from one day to the next | 51.58 | 52.92 |  |
| RA9: CV, number of flow reversals from one day to the next | 25.03 | 22.52 |  |

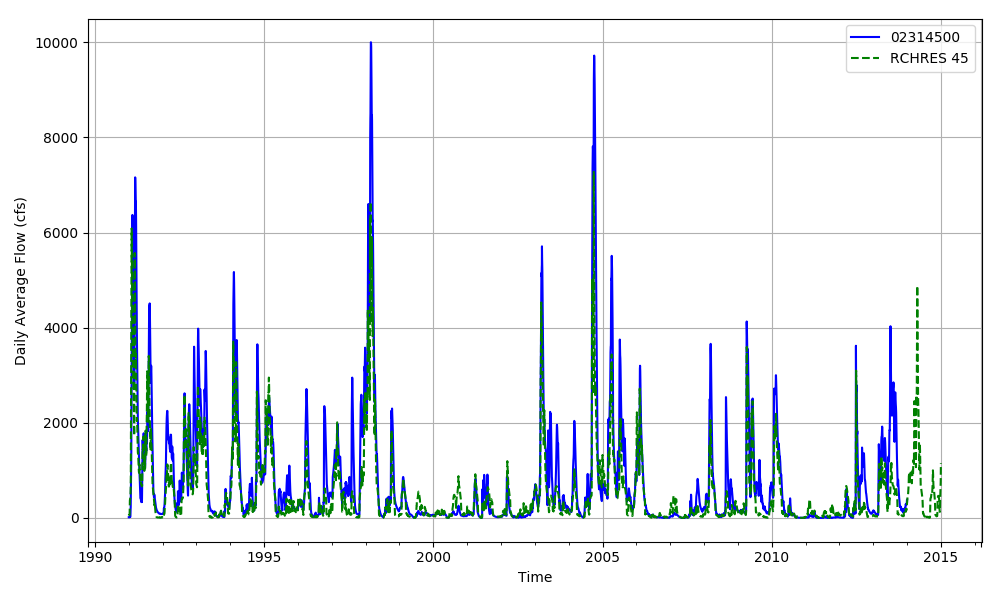


Figure 03110201-19: Daily flow for HSFP reach 45 and USGS station 02314500.

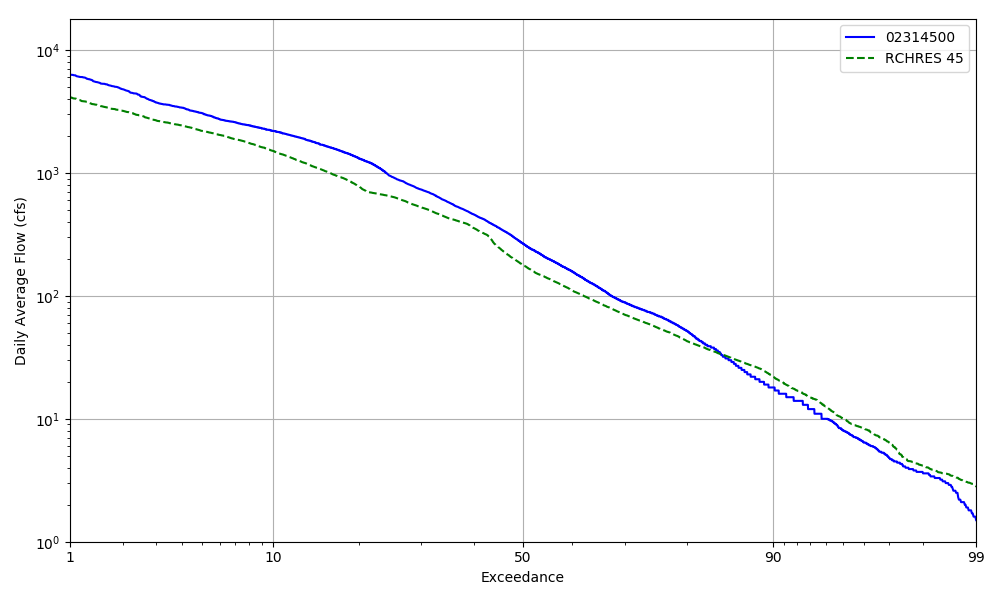


Figure 03110201-20: Daily exceedance for HSFP reach 45 and USGS station 02314500.

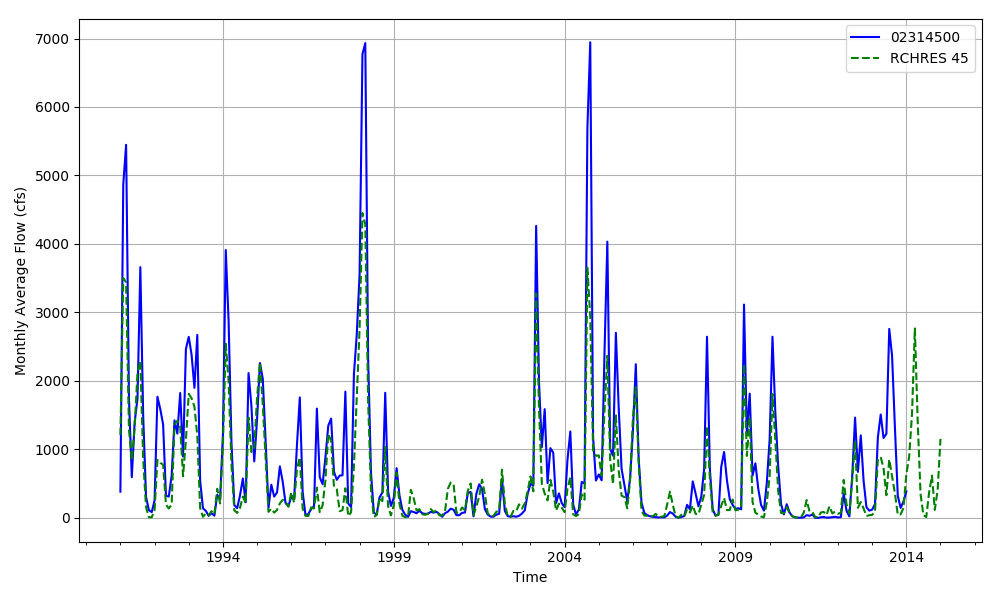


Figure 03110201-21: Monthly flow for HSFP reach 45 and USGS station 02314500.