# Appendix for Model 03100207

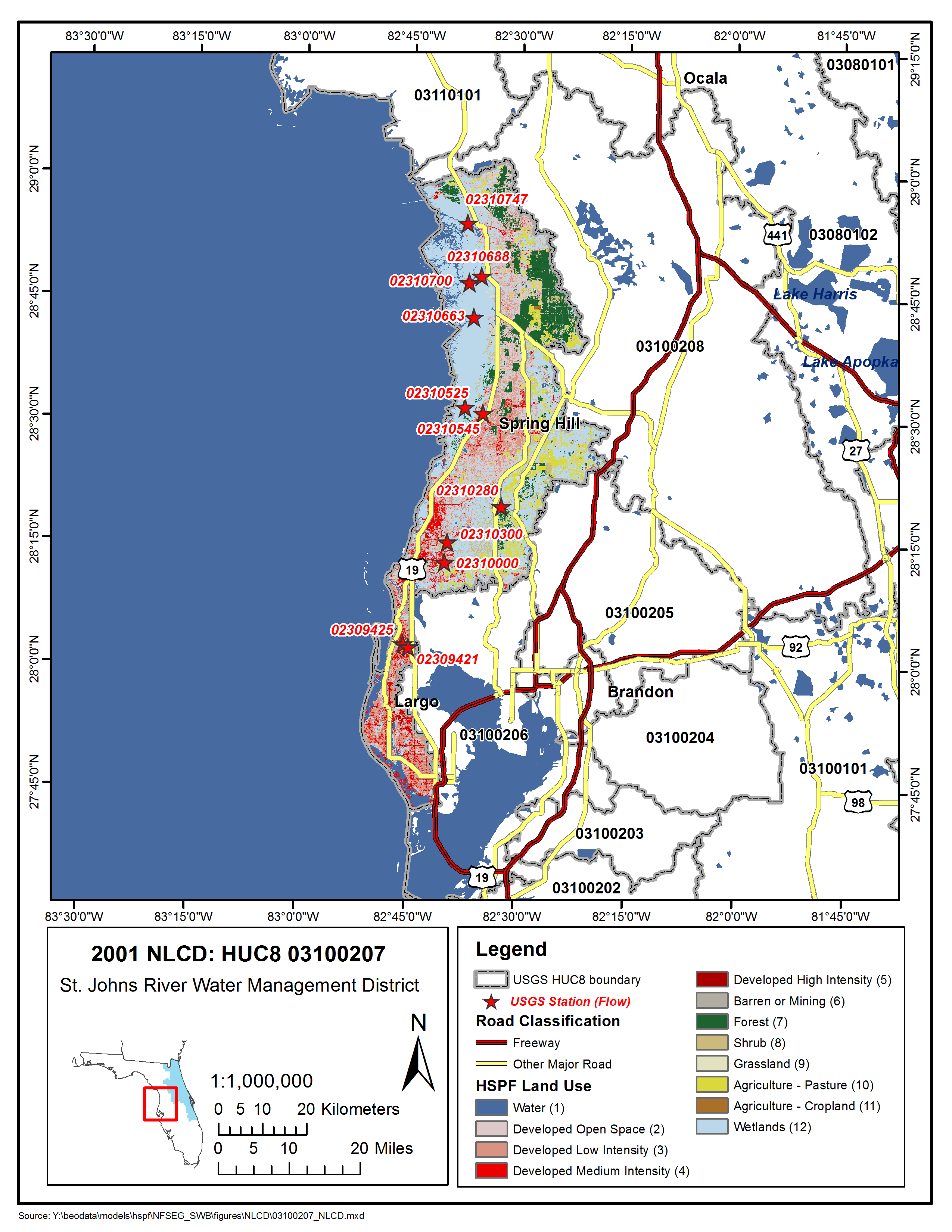


Figure 03100207-1: Land Cover from the National Land Cover Database.

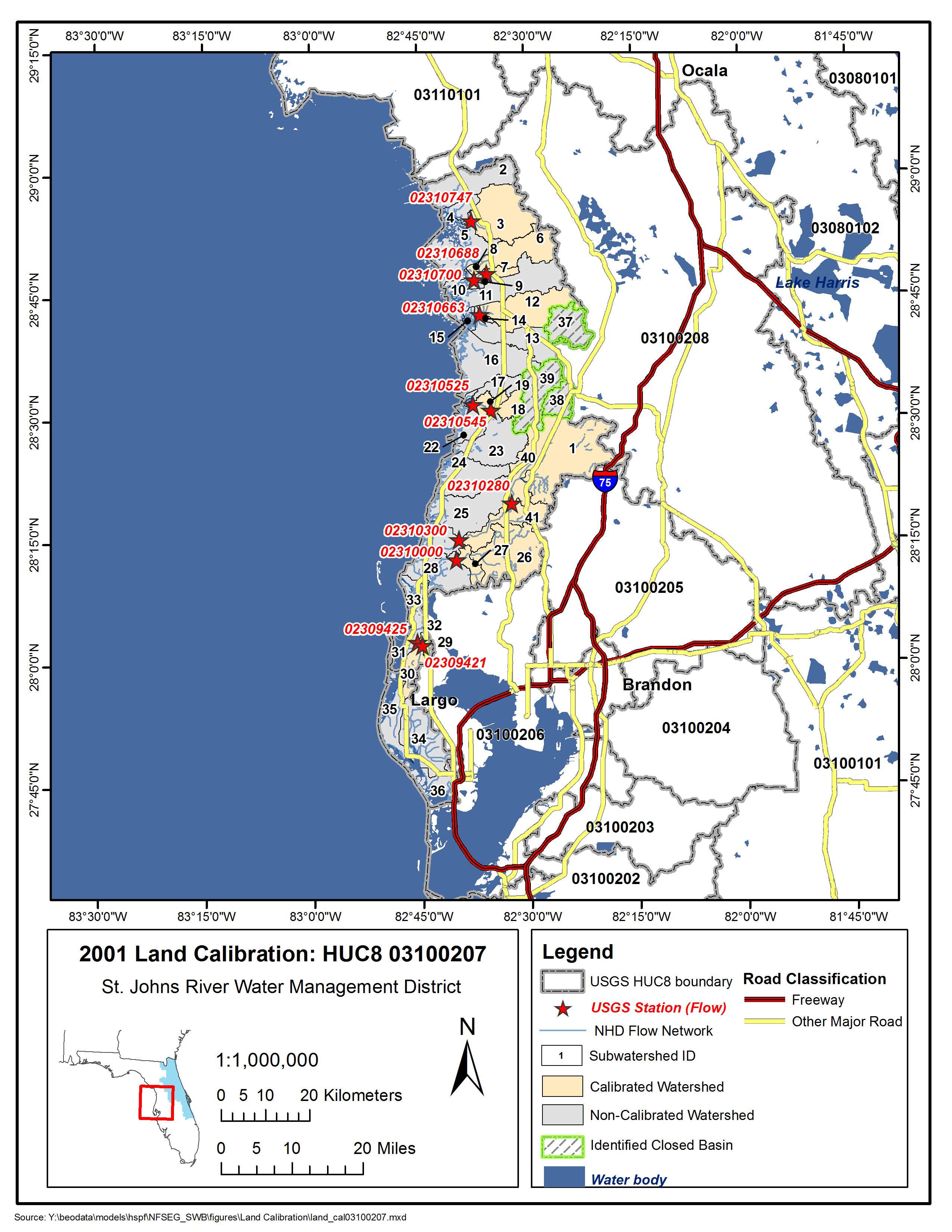


Figure 03100207-2: Calibrated sub-watersheds.

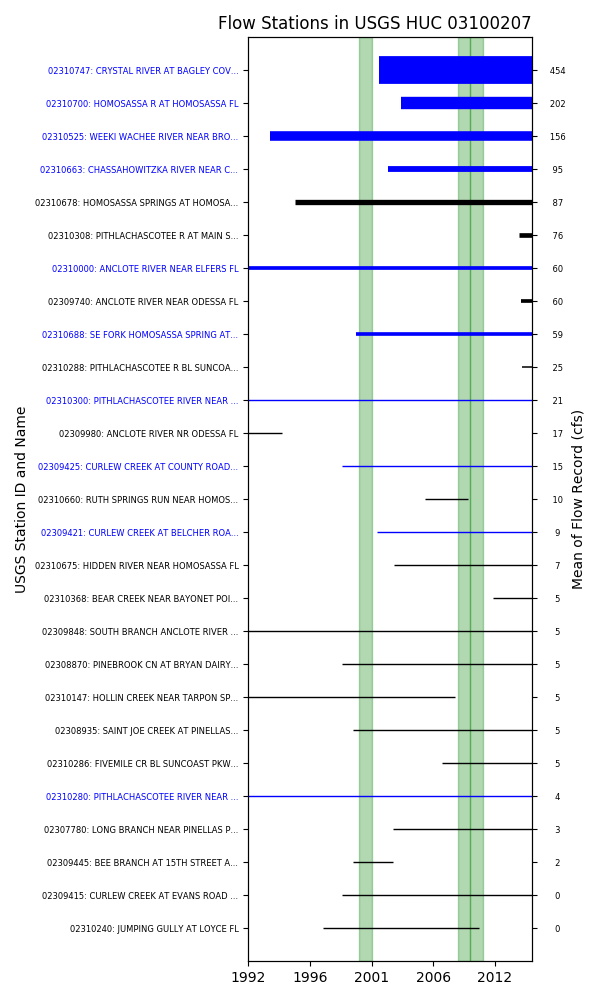


Figure 03100207-3: Station period of record. Blue color identifies gauges used for calibration.

## HSPF Reach 03, USGS Gauge 02310747

Table 03100207-1: Comparison Statistics Between HSPF Reach 03 and USGS Gauge 02310747.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | -429.46 |
| Standard error | 480.83 |
| Relative bias | -0.93 |
| Relative standard error | 2.26 |
| Nash-Sutcliffe coefficient | -4.13 |
| Coefficient of efficiency | -1.59 |
| Index of agreement | 0.27 |

Table 03100207-2: Hydrologic Indices Between USGS Gauge 02310747 and HSPF Reach 03.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02310747 | Simulated Reach 03 | Percent Difference |
| MA1: Mean, all daily flows | 540.61 | 33.34 | -93.83 |
| MA2: Median, all daily flows | 492.00 | 15.56 | -96.84 |
| MA3: CV, all daily flows | 59.87 | 138.77 | 131.79 |
| MA4: CV, log of all daily flows | 56.22 | 114.24 | 103.18 |
| MA5: Mean daily flow / median daily flow | 1.10 | 2.14 | 94.94 |
| MA9: (Q10 - Q90) / median daily flow | 1.71 | 5.31 | 209.47 |
| MA10: (Q20 - Q80) / median daily flow | 1.11 | 2.92 | 162.31 |
| MA11: (Q25 - Q75) / median daily flow | 0.87 | 2.19 | 152.19 |
| MA12: Mean monthly flow, January | 637.94 | 15.75 | -97.53 |
| MA13: Mean monthly flow, February | 560.80 | 33.26 | -94.07 |
| MA14: Mean monthly flow, March | 527.82 | 35.92 | -93.20 |
| MA15: Mean monthly flow, April | 477.80 | 18.82 | -96.06 |
| MA16: Mean monthly flow, May | 385.74 | 12.52 | -96.75 |
| MA17: Mean monthly flow, June | 356.12 | 28.51 | -91.99 |
| MA18: Mean monthly flow, July | 340.53 | 48.01 | -85.90 |
| MA19: Mean monthly flow, August | 384.96 | 70.91 | -81.58 |
| MA20: Mean monthly flow, September | 433.13 | 57.31 | -86.77 |
| MA21: Mean monthly flow, October | 476.79 | 22.53 | -95.27 |
| MA22: Mean monthly flow, November | 572.23 | 8.25 | -98.56 |
| MA23: Mean monthly flow, December | 658.25 | 19.53 | -97.03 |
| ML1: Mean minimum monthly flow, January | 107.89 | 5.18 | -95.20 |
| ML2: Mean minimum monthly flow, February | 136.52 | 11.25 | -91.76 |
| ML3: Mean minimum monthly flow, March | 115.92 | 11.59 | -90.00 |
| ML4: Mean minimum monthly flow, April | 112.80 | 5.45 | -95.17 |
| ML5: Mean minimum monthly flow, May | 67.23 | 2.86 | -95.75 |
| ML6: Mean minimum monthly flow, June | 64.11 | 7.39 | -88.48 |
| ML7: Mean minimum monthly flow, July | 58.86 | 19.11 | -67.53 |
| ML8: Mean minimum monthly flow, August | 70.83 | 23.61 | -66.66 |
| ML9: Mean minimum monthly flow, September | 76.67 | 13.28 | -82.68 |
| ML10: Mean minimum monthly flow, October | 74.04 | 7.26 | -90.19 |
| ML11: Mean minimum monthly flow, November | 51.61 | 3.63 | -92.97 |
| ML12: Mean minimum monthly flow, December | 118.75 | 4.98 | -95.80 |
| ML13: CV of minimum monthly flows | 112.13 | 104.34 | -6.95 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.02 | 0.10 | 414.44 |
| ML15: Mean minimum annual flow / mean annual flow | 0.02 | 0.07 | 258.71 |
| ML16: Median minimum annual flow / median annual flow | 0.02 | 0.08 | 284.29 |
| ML20: Ratio of baseflow volume to total flow volume | 0.26 | 0.40 | 55.91 |
| ML22: Mean annual minimum flow divided by catchment area | 0.10 | 0.03 | -68.80 |
| RA1: Mean of positive changes from one day to next (rise rate) | 284.59 | 19.85 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 102.99 | 250.65 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 263.49 | 4.96 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 94.63 | 275.73 |  |
| RA5: Ratio of days that are higher than previous day | 0.48 | 0.20 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.45 | 0.27 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.44 | 0.10 |  |
| RA8: Number of flow reversals from one day to the next | 171.00 | 67.69 |  |
| RA9: CV, number of flow reversals from one day to the next | 29.29 | 27.99 |  |

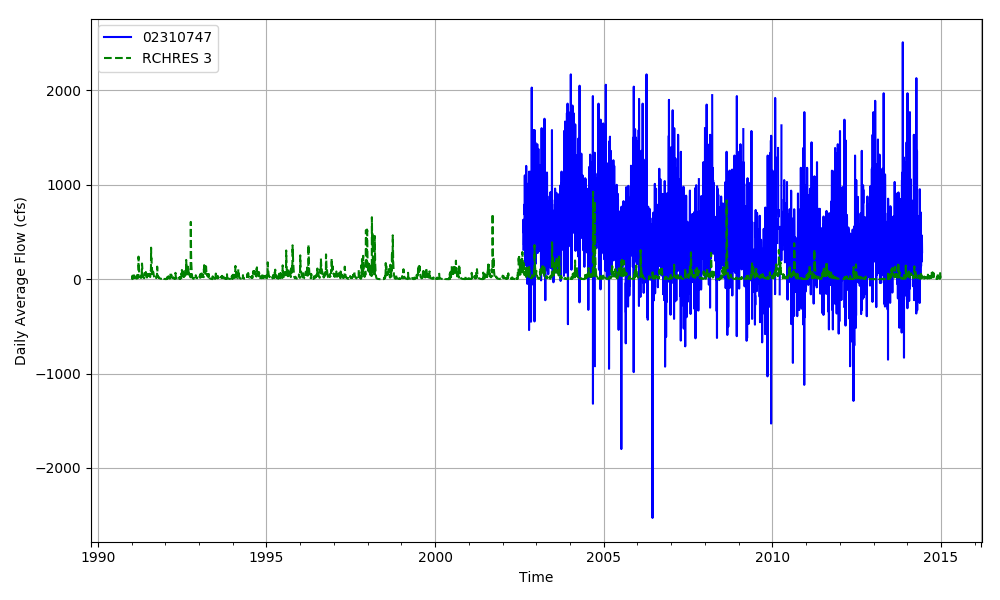


Figure 03100207-4: Daily flow for HSFP reach 03 and USGS station 02310747.

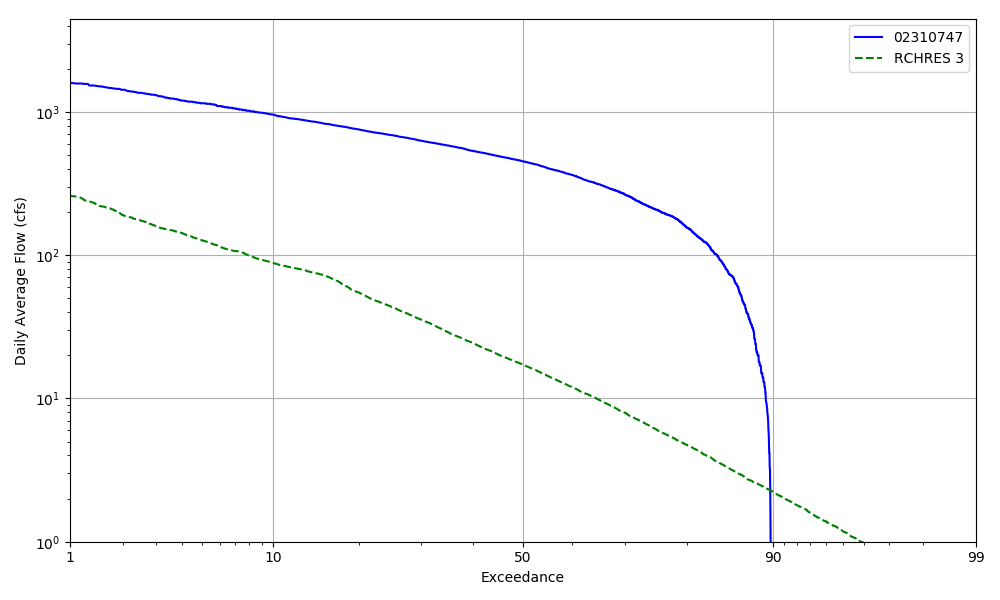


Figure 03100207-5: Daily exceedance for HSFP reach 03 and USGS station 02310747.

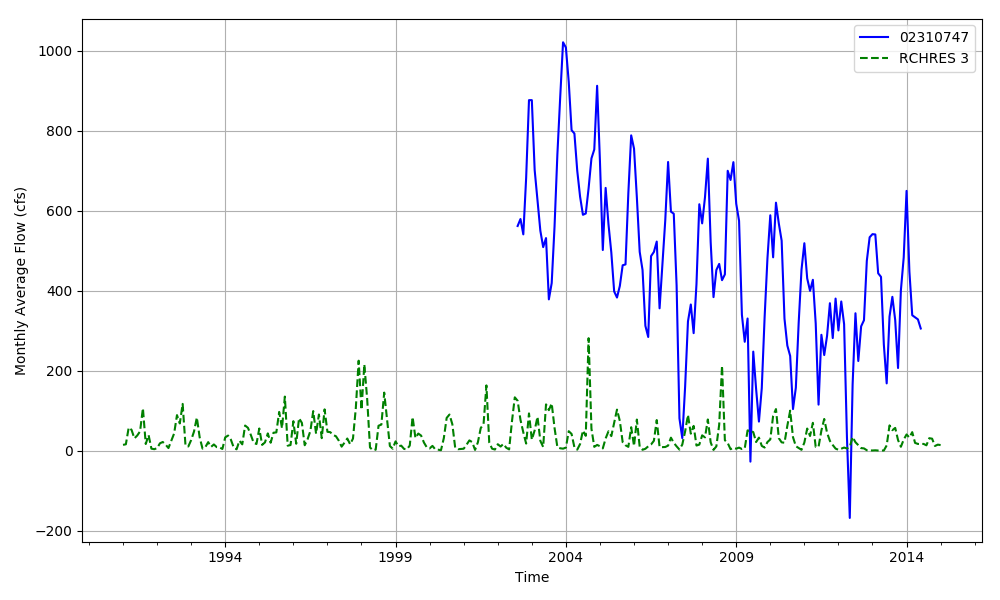


Figure 03100207-6: Monthly flow for HSFP reach 03 and USGS station 02310747.

## HSPF Reach 07, USGS Gauge 02310688

Table 03100207-3: Comparison Statistics Between HSPF Reach 07 and USGS Gauge 02310688.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | 1.25 |
| Standard error | 5.02 |
| Relative bias | 0.02 |
| Relative standard error | 0.52 |
| Nash-Sutcliffe coefficient | 0.72 |
| Coefficient of efficiency | 0.53 |
| Index of agreement | 0.75 |

Table 03100207-4: Hydrologic Indices Between USGS Gauge 02310688 and HSPF Reach 07.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02310688 | Simulated Reach 07 | Percent Difference |
| MA1: Mean, all daily flows | 59.53 | 60.73 | 2.01 |
| MA2: Median, all daily flows | 58.00 | 57.35 | -1.12 |
| MA3: CV, all daily flows | 12.82 | 8.53 | -33.50 |
| MA4: CV, log of all daily flows | 16.25 | 13.85 | -14.74 |
| MA5: Mean daily flow / median daily flow | 1.03 | 1.06 | 3.17 |
| MA9: (Q10 - Q90) / median daily flow | 0.48 | 0.41 | -14.44 |
| MA10: (Q20 - Q80) / median daily flow | 0.31 | 0.23 | -25.27 |
| MA11: (Q25 - Q75) / median daily flow | 0.24 | 0.18 | -24.75 |
| MA12: Mean monthly flow, January | 61.42 | 62.15 | 1.19 |
| MA13: Mean monthly flow, February | 55.51 | 57.14 | 2.93 |
| MA14: Mean monthly flow, March | 53.36 | 54.72 | 2.54 |
| MA15: Mean monthly flow, April | 52.21 | 53.57 | 2.59 |
| MA16: Mean monthly flow, May | 49.54 | 53.37 | 7.74 |
| MA17: Mean monthly flow, June | 49.94 | 52.35 | 4.82 |
| MA18: Mean monthly flow, July | 54.11 | 55.70 | 2.93 |
| MA19: Mean monthly flow, August | 56.30 | 57.78 | 2.63 |
| MA20: Mean monthly flow, September | 58.70 | 59.21 | 0.87 |
| MA21: Mean monthly flow, October | 63.34 | 63.32 | -0.03 |
| MA22: Mean monthly flow, November | 61.67 | 61.36 | -0.52 |
| MA23: Mean monthly flow, December | 62.15 | 61.92 | -0.37 |
| ML1: Mean minimum monthly flow, January | 52.57 | 59.27 | 12.74 |
| ML2: Mean minimum monthly flow, February | 49.54 | 56.66 | 14.37 |
| ML3: Mean minimum monthly flow, March | 45.85 | 54.66 | 19.22 |
| ML4: Mean minimum monthly flow, April | 47.15 | 54.70 | 16.01 |
| ML5: Mean minimum monthly flow, May | 46.38 | 54.74 | 18.01 |
| ML6: Mean minimum monthly flow, June | 43.92 | 51.93 | 18.24 |
| ML7: Mean minimum monthly flow, July | 49.54 | 55.22 | 11.48 |
| ML8: Mean minimum monthly flow, August | 51.85 | 58.23 | 12.31 |
| ML9: Mean minimum monthly flow, September | 53.00 | 58.78 | 10.90 |
| ML10: Mean minimum monthly flow, October | 53.93 | 60.21 | 11.64 |
| ML11: Mean minimum monthly flow, November | 51.64 | 58.94 | 14.14 |
| ML12: Mean minimum monthly flow, December | 51.14 | 58.47 | 14.33 |
| ML13: CV of minimum monthly flows | 19.00 | 15.27 | -19.64 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.66 | 0.82 | 24.09 |
| ML15: Mean minimum annual flow / mean annual flow | 0.66 | 0.82 | 24.48 |
| ML16: Median minimum annual flow / median annual flow | 0.68 | 0.82 | 21.10 |
| ML20: Ratio of baseflow volume to total flow volume | 0.90 | 0.98 | 8.45 |
| ML22: Mean annual minimum flow divided by catchment area | 0.39 | 0.49 | 25.89 |
| RA1: Mean of positive changes from one day to next (rise rate) | 4.12 | 1.40 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 99.11 | 274.17 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 3.64 | 1.03 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 89.03 | 227.83 |  |
| RA5: Ratio of days that are higher than previous day | 0.40 | 0.40 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.05 | 0.01 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.05 | 0.01 |  |
| RA8: Number of flow reversals from one day to the next | 139.93 | 81.50 |  |
| RA9: CV, number of flow reversals from one day to the next | 21.20 | 29.48 |  |

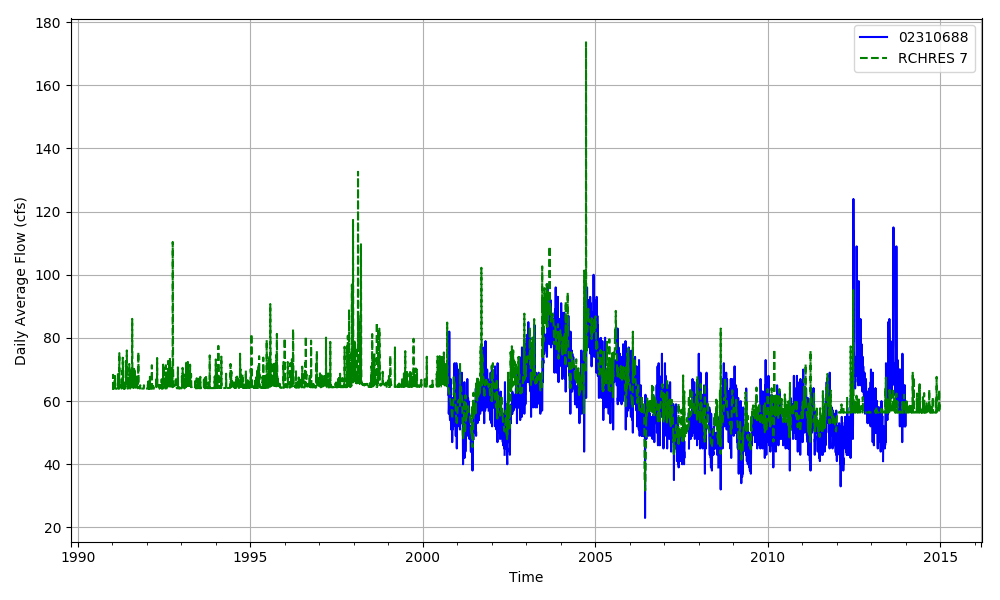


Figure 03100207-7: Daily flow for HSFP reach 07 and USGS station 02310688.

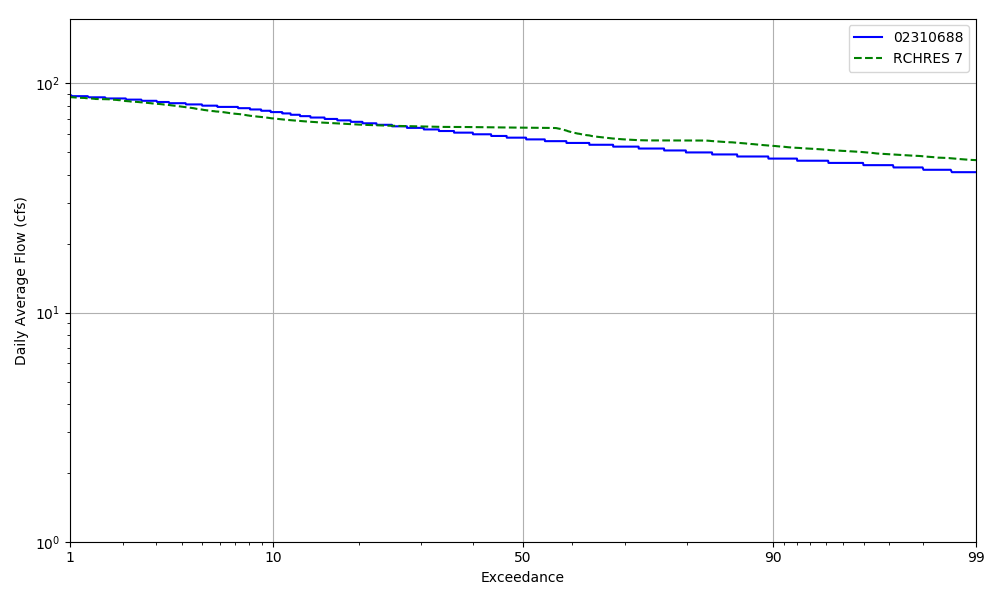


Figure 03100207-8: Daily exceedance for HSFP reach 07 and USGS station 02310688.

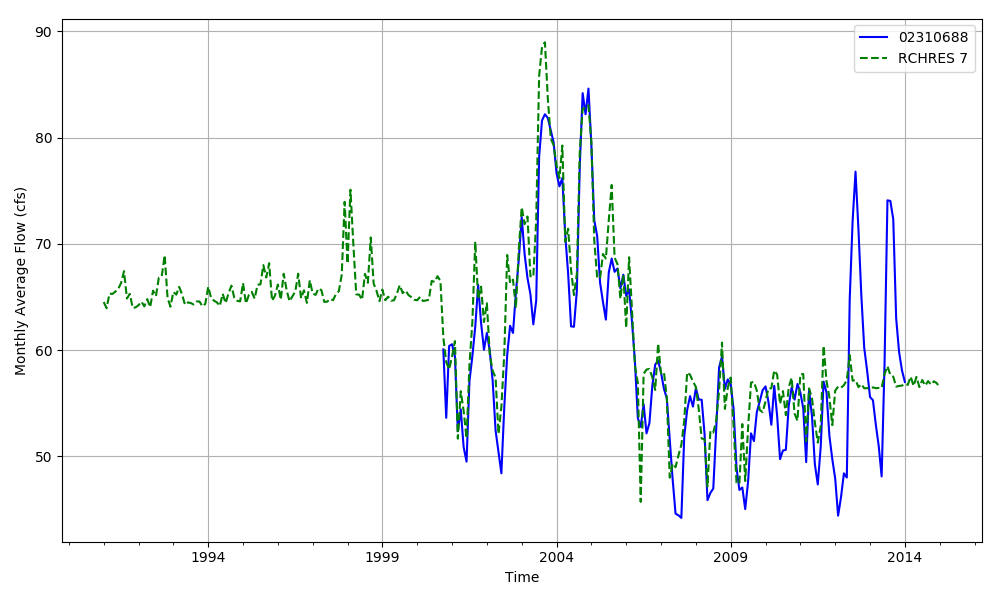


Figure 03100207-9: Monthly flow for HSFP reach 07 and USGS station 02310688.

## HSPF Reach 09, USGS Gauge 02310700

Table 03100207-5: Comparison Statistics Between HSPF Reach 09 and USGS Gauge 02310700.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | -114.58 |
| Standard error | 132.02 |
| Relative bias | -0.57 |
| Relative standard error | 1.92 |
| Nash-Sutcliffe coefficient | -2.70 |
| Coefficient of efficiency | -1.25 |
| Index of agreement | 0.31 |

Table 03100207-6: Hydrologic Indices Between USGS Gauge 02310700 and HSPF Reach 09.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02310700 | Simulated Reach 09 | Percent Difference |
| MA1: Mean, all daily flows | 225.53 | 88.85 | -60.60 |
| MA2: Median, all daily flows | 206.00 | 74.46 | -63.85 |
| MA3: CV, all daily flows | 61.56 | 50.49 | -17.99 |
| MA4: CV, log of all daily flows | 50.65 | 31.90 | -37.01 |
| MA5: Mean daily flow / median daily flow | 1.09 | 1.19 | 8.99 |
| MA9: (Q10 - Q90) / median daily flow | 1.53 | 0.90 | -41.38 |
| MA10: (Q20 - Q80) / median daily flow | 0.96 | 0.48 | -50.14 |
| MA11: (Q25 - Q75) / median daily flow | 0.77 | 0.37 | -52.36 |
| MA12: Mean monthly flow, January | 240.12 | 65.51 | -72.72 |
| MA13: Mean monthly flow, February | 164.09 | 63.34 | -61.40 |
| MA14: Mean monthly flow, March | 182.02 | 69.62 | -61.75 |
| MA15: Mean monthly flow, April | 174.20 | 63.49 | -63.55 |
| MA16: Mean monthly flow, May | 156.33 | 67.59 | -56.77 |
| MA17: Mean monthly flow, June | 193.81 | 76.57 | -60.49 |
| MA18: Mean monthly flow, July | 197.06 | 96.83 | -50.86 |
| MA19: Mean monthly flow, August | 216.31 | 112.63 | -47.93 |
| MA20: Mean monthly flow, September | 230.22 | 103.67 | -54.97 |
| MA21: Mean monthly flow, October | 208.11 | 76.06 | -63.45 |
| MA22: Mean monthly flow, November | 182.88 | 56.91 | -68.88 |
| MA23: Mean monthly flow, December | 227.28 | 66.07 | -70.93 |
| ML1: Mean minimum monthly flow, January | 105.90 | 65.40 | -38.25 |
| ML2: Mean minimum monthly flow, February | 45.12 | 68.43 | 51.65 |
| ML3: Mean minimum monthly flow, March | 32.26 | 64.61 | 100.32 |
| ML4: Mean minimum monthly flow, April | 9.24 | 63.87 | 591.49 |
| ML5: Mean minimum monthly flow, May | 24.46 | 63.48 | 159.54 |
| ML6: Mean minimum monthly flow, June | 55.64 | 64.79 | 16.43 |
| ML7: Mean minimum monthly flow, July | 61.47 | 75.84 | 23.37 |
| ML8: Mean minimum monthly flow, August | 44.88 | 75.95 | 69.22 |
| ML9: Mean minimum monthly flow, September | 55.00 | 72.57 | 31.95 |
| ML10: Mean minimum monthly flow, October | 52.12 | 70.67 | 35.59 |
| ML11: Mean minimum monthly flow, November | 47.00 | 64.80 | 37.88 |
| ML12: Mean minimum monthly flow, December | 66.23 | 65.22 | -1.53 |
| ML13: CV of minimum monthly flows | 127.58 | 15.32 | -88.00 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.02 | 0.78 | 3530.63 |
| ML15: Mean minimum annual flow / mean annual flow | 0.02 | 0.66 | 3360.22 |
| ML16: Median minimum annual flow / median annual flow | 0.01 | 0.77 | 9719.21 |
| ML20: Ratio of baseflow volume to total flow volume | 0.28 | 0.83 | 194.23 |
| ML22: Mean annual minimum flow divided by catchment area | 0.04 | 0.58 | 1207.73 |
| RA1: Mean of positive changes from one day to next (rise rate) | 117.45 | 12.06 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 120.33 | 328.50 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 101.96 | 4.37 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 100.67 | 275.48 |  |
| RA5: Ratio of days that are higher than previous day | 0.46 | 0.27 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.40 | 0.02 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.38 | 0.02 |  |
| RA8: Number of flow reversals from one day to the next | 157.00 | 69.64 |  |
| RA9: CV, number of flow reversals from one day to the next | 32.84 | 35.20 |  |

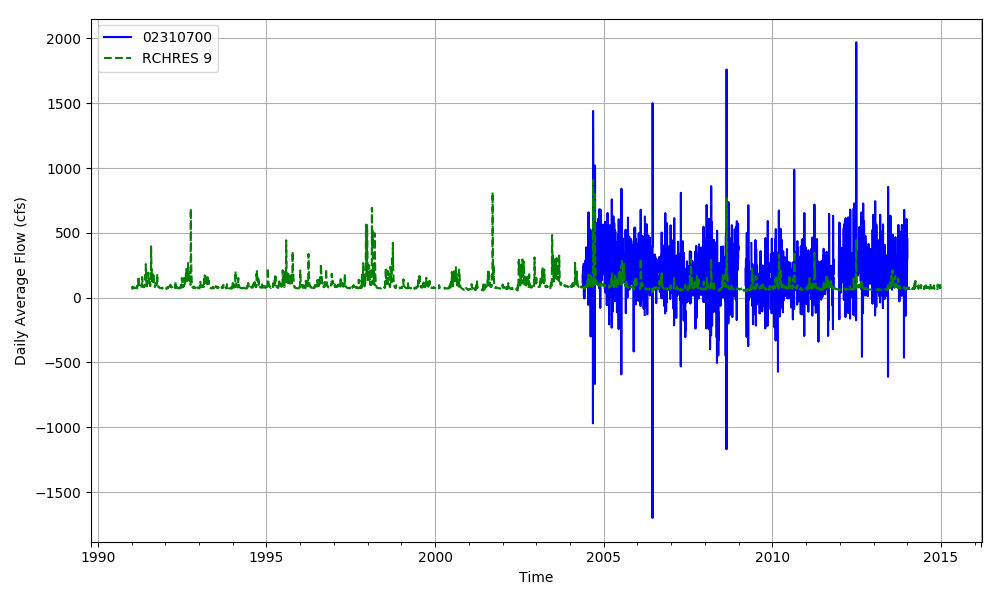


Figure 03100207-10: Daily flow for HSFP reach 09 and USGS station 02310700.

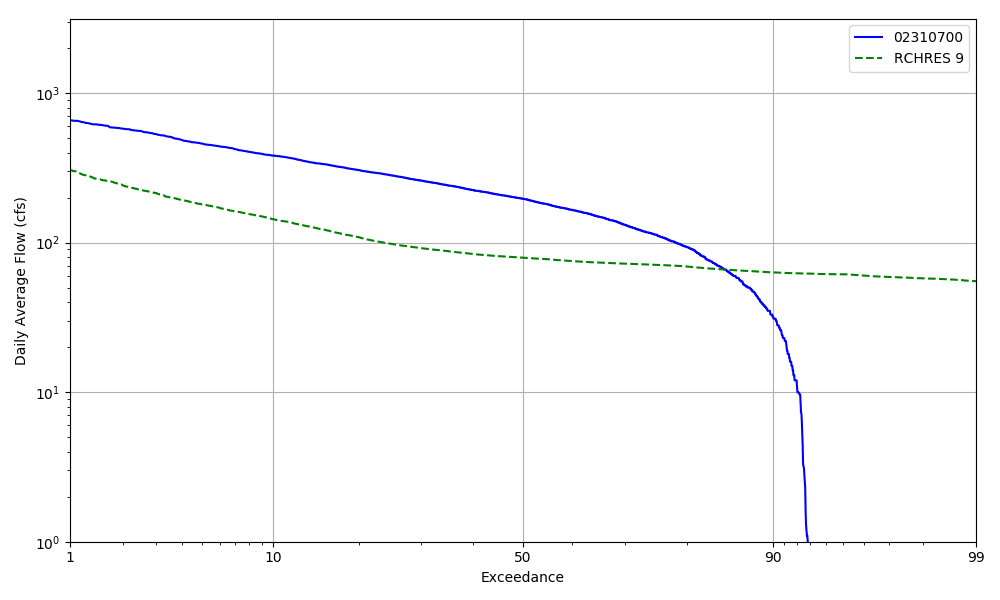


Figure 03100207-11: Daily exceedance for HSFP reach 09 and USGS station 02310700.

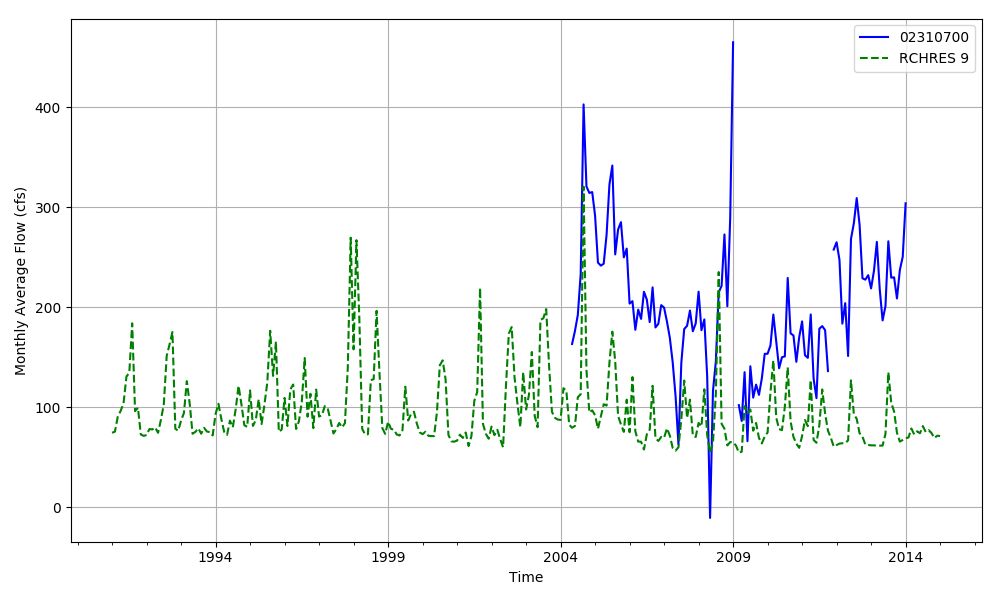


Figure 03100207-12: Monthly flow for HSFP reach 09 and USGS station 02310700.

## HSPF Reach 12, USGS Gauge 02310663

Table 03100207-7: Comparison Statistics Between HSPF Reach 12 and USGS Gauge 02310663.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | 49.97 |
| Standard error | 87.08 |
| Relative bias | 0.50 |
| Relative standard error | 0.99 |
| Nash-Sutcliffe coefficient | 0.02 |
| Coefficient of efficiency | -0.01 |
| Index of agreement | 0.40 |

Table 03100207-8: Hydrologic Indices Between USGS Gauge 02310663 and HSPF Reach 12.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02310663 | Simulated Reach 12 | Percent Difference |
| MA1: Mean, all daily flows | 135.58 | 148.78 | 9.74 |
| MA2: Median, all daily flows | 117.00 | 132.53 | 13.27 |
| MA3: CV, all daily flows | 67.78 | 31.40 | -53.67 |
| MA4: CV, log of all daily flows | 65.20 | 23.04 | -64.67 |
| MA5: Mean daily flow / median daily flow | 1.16 | 1.12 | -3.12 |
| MA9: (Q10 - Q90) / median daily flow | 2.09 | 0.69 | -66.94 |
| MA10: (Q20 - Q80) / median daily flow | 1.35 | 0.35 | -73.77 |
| MA11: (Q25 - Q75) / median daily flow | 1.06 | 0.26 | -75.97 |
| MA12: Mean monthly flow, January | 104.00 | 119.24 | 14.65 |
| MA13: Mean monthly flow, February | 114.90 | 129.18 | 12.43 |
| MA14: Mean monthly flow, March | 117.22 | 130.19 | 11.07 |
| MA15: Mean monthly flow, April | 108.15 | 124.42 | 15.04 |
| MA16: Mean monthly flow, May | 106.93 | 134.20 | 25.51 |
| MA17: Mean monthly flow, June | 131.43 | 158.44 | 20.55 |
| MA18: Mean monthly flow, July | 132.01 | 172.44 | 30.63 |
| MA19: Mean monthly flow, August | 147.56 | 178.15 | 20.73 |
| MA20: Mean monthly flow, September | 138.08 | 149.03 | 7.93 |
| MA21: Mean monthly flow, October | 109.99 | 135.18 | 22.90 |
| MA22: Mean monthly flow, November | 106.92 | 118.52 | 10.84 |
| MA23: Mean monthly flow, December | 111.19 | 116.61 | 4.88 |
| ML1: Mean minimum monthly flow, January | 17.47 | 122.54 | 601.23 |
| ML2: Mean minimum monthly flow, February | 38.47 | 120.21 | 212.47 |
| ML3: Mean minimum monthly flow, March | 22.39 | 110.95 | 395.50 |
| ML4: Mean minimum monthly flow, April | 9.33 | 106.04 | 1036.18 |
| ML5: Mean minimum monthly flow, May | 20.21 | 112.79 | 458.13 |
| ML6: Mean minimum monthly flow, June | 33.40 | 120.79 | 261.66 |
| ML7: Mean minimum monthly flow, July | 54.29 | 145.95 | 168.82 |
| ML8: Mean minimum monthly flow, August | 42.60 | 130.66 | 206.70 |
| ML9: Mean minimum monthly flow, September | 47.49 | 127.90 | 169.31 |
| ML10: Mean minimum monthly flow, October | 15.91 | 126.75 | 696.72 |
| ML11: Mean minimum monthly flow, November | 17.55 | 119.17 | 579.22 |
| ML12: Mean minimum monthly flow, December | 26.84 | 116.39 | 333.68 |
| ML13: CV of minimum monthly flows | 144.43 | 22.20 | -84.63 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.01 | 0.55 | 3766.25 |
| ML15: Mean minimum annual flow / mean annual flow | 0.01 | 0.50 | 3765.32 |
| ML16: Median minimum annual flow / median annual flow | 0.01 | 0.66 | 5316.16 |
| ML20: Ratio of baseflow volume to total flow volume | 0.30 | 0.88 | 188.79 |
| ML22: Mean annual minimum flow divided by catchment area | 0.02 | 0.78 | 4240.49 |
| RA1: Mean of positive changes from one day to next (rise rate) | 67.55 | 12.46 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 135.38 | 263.72 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 57.08 | 5.68 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 120.89 | 216.92 |  |
| RA5: Ratio of days that are higher than previous day | 0.45 | 0.31 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.42 | 0.02 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.36 | 0.01 |  |
| RA8: Number of flow reversals from one day to the next | 140.17 | 90.58 |  |
| RA9: CV, number of flow reversals from one day to the next | 25.26 | 32.31 |  |

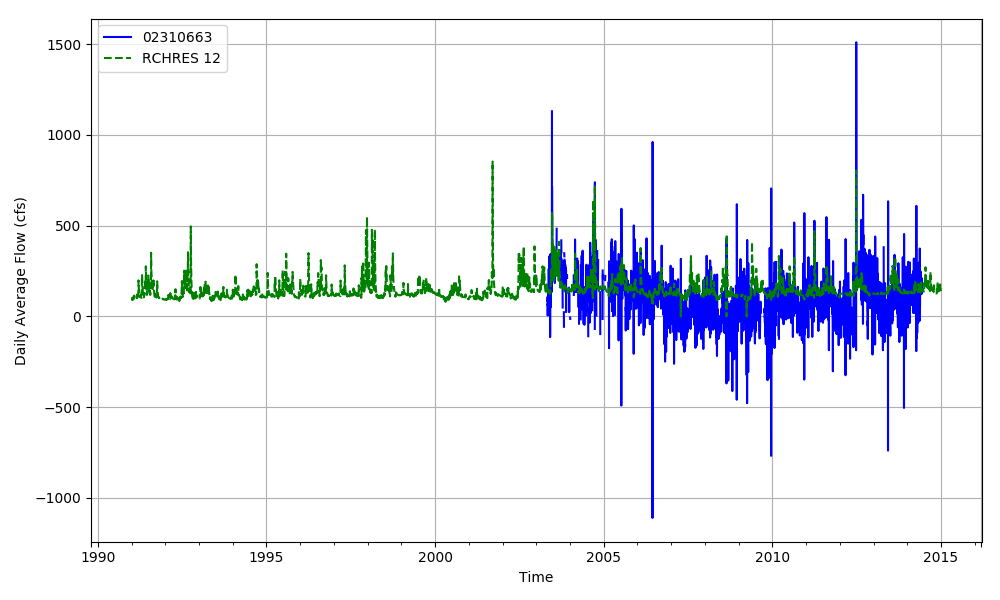


Figure 03100207-13: Daily flow for HSFP reach 12 and USGS station 02310663.

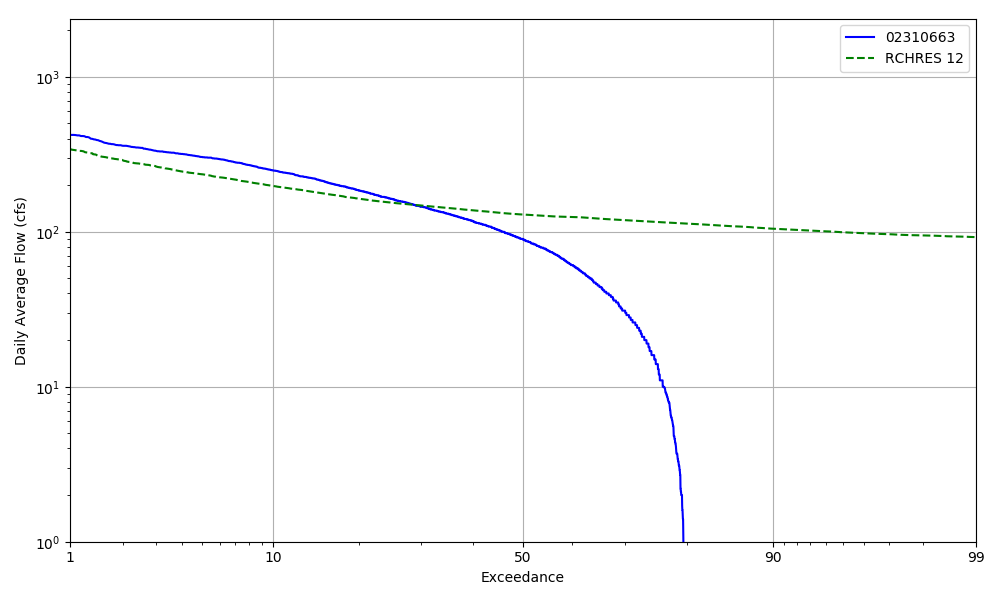


Figure 03100207-14: Daily exceedance for HSFP reach 12 and USGS station 02310663.

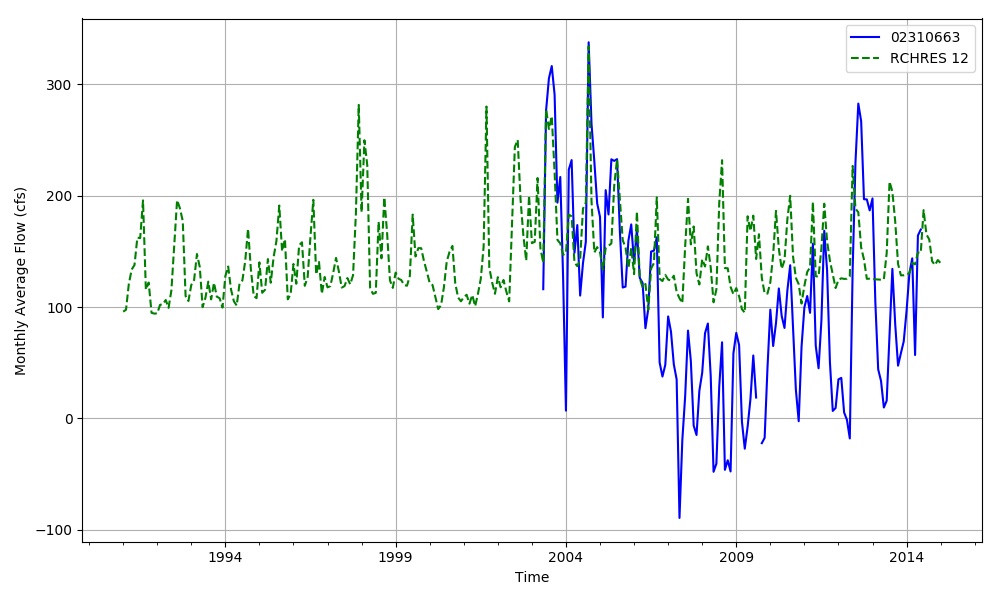


Figure 03100207-15: Monthly flow for HSFP reach 12 and USGS station 02310663.

## HSPF Reach 18, USGS Gauge 02310525

Table 03100207-9: Comparison Statistics Between HSPF Reach 18 and USGS Gauge 02310525.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | 4.98 |
| Standard error | 21.76 |
| Relative bias | 0.03 |
| Relative standard error | 0.70 |
| Nash-Sutcliffe coefficient | 0.52 |
| Coefficient of efficiency | 0.38 |
| Index of agreement | 0.64 |

Table 03100207-10: Hydrologic Indices Between USGS Gauge 02310525 and HSPF Reach 18.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02310525 | Simulated Reach 18 | Percent Difference |
| MA1: Mean, all daily flows | 155.65 | 160.80 | 3.31 |
| MA2: Median, all daily flows | 148.00 | 156.21 | 5.55 |
| MA3: CV, all daily flows | 11.23 | 10.12 | -9.85 |
| MA4: CV, log of all daily flows | 18.26 | 13.62 | -25.43 |
| MA5: Mean daily flow / median daily flow | 1.05 | 1.03 | -2.12 |
| MA9: (Q10 - Q90) / median daily flow | 0.55 | 0.41 | -25.56 |
| MA10: (Q20 - Q80) / median daily flow | 0.35 | 0.21 | -39.70 |
| MA11: (Q25 - Q75) / median daily flow | 0.28 | 0.16 | -42.22 |
| MA12: Mean monthly flow, January | 157.04 | 156.37 | -0.43 |
| MA13: Mean monthly flow, February | 145.94 | 149.21 | 2.25 |
| MA14: Mean monthly flow, March | 142.64 | 149.25 | 4.64 |
| MA15: Mean monthly flow, April | 139.28 | 145.23 | 4.27 |
| MA16: Mean monthly flow, May | 132.91 | 139.83 | 5.21 |
| MA17: Mean monthly flow, June | 131.38 | 145.26 | 10.56 |
| MA18: Mean monthly flow, July | 142.54 | 157.38 | 10.41 |
| MA19: Mean monthly flow, August | 152.58 | 164.99 | 8.13 |
| MA20: Mean monthly flow, September | 163.08 | 170.08 | 4.30 |
| MA21: Mean monthly flow, October | 172.95 | 168.70 | -2.46 |
| MA22: Mean monthly flow, November | 168.03 | 161.22 | -4.06 |
| MA23: Mean monthly flow, December | 161.19 | 159.97 | -0.76 |
| ML1: Mean minimum monthly flow, January | 152.67 | 151.33 | -0.87 |
| ML2: Mean minimum monthly flow, February | 149.45 | 150.46 | 0.68 |
| ML3: Mean minimum monthly flow, March | 146.50 | 149.79 | 2.24 |
| ML4: Mean minimum monthly flow, April | 142.25 | 146.99 | 3.33 |
| ML5: Mean minimum monthly flow, May | 135.40 | 142.24 | 5.05 |
| ML6: Mean minimum monthly flow, June | 133.05 | 142.62 | 7.20 |
| ML7: Mean minimum monthly flow, July | 143.75 | 152.18 | 5.86 |
| ML8: Mean minimum monthly flow, August | 153.95 | 160.15 | 4.03 |
| ML9: Mean minimum monthly flow, September | 164.55 | 165.60 | 0.64 |
| ML10: Mean minimum monthly flow, October | 168.71 | 161.70 | -4.16 |
| ML11: Mean minimum monthly flow, November | 163.86 | 156.91 | -4.24 |
| ML12: Mean minimum monthly flow, December | 156.76 | 153.92 | -1.81 |
| ML13: CV of minimum monthly flows | 20.13 | 15.05 | -25.26 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.85 | 0.90 | 5.77 |
| ML15: Mean minimum annual flow / mean annual flow | 0.83 | 0.88 | 5.11 |
| ML16: Median minimum annual flow / median annual flow | 0.85 | 0.93 | 10.06 |
| ML20: Ratio of baseflow volume to total flow volume | 1.00 | 0.98 | -1.96 |
| ML22: Mean annual minimum flow divided by catchment area | 1.31 | 1.41 | 7.46 |
| RA1: Mean of positive changes from one day to next (rise rate) | 1.31 | 8.21 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 85.04 | 182.08 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 1.02 | 2.08 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 36.93 | 251.15 |  |
| RA5: Ratio of days that are higher than previous day | 0.15 | 0.20 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.01 | 0.02 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.01 | 0.00 |  |
| RA8: Number of flow reversals from one day to the next | 16.81 | 87.19 |  |
| RA9: CV, number of flow reversals from one day to the next | 37.37 | 28.59 |  |

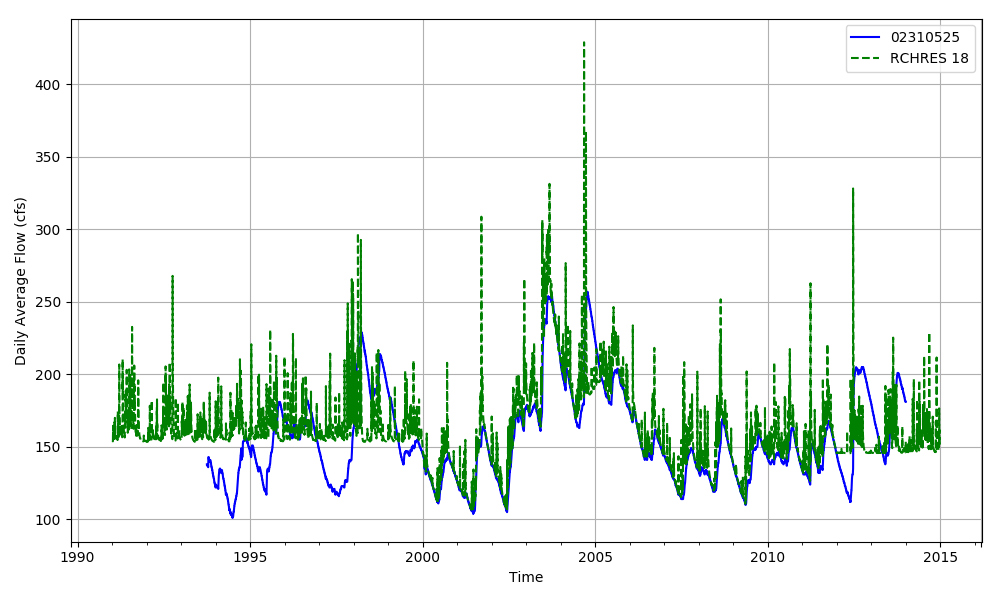


Figure 03100207-16: Daily flow for HSFP reach 18 and USGS station 02310525.

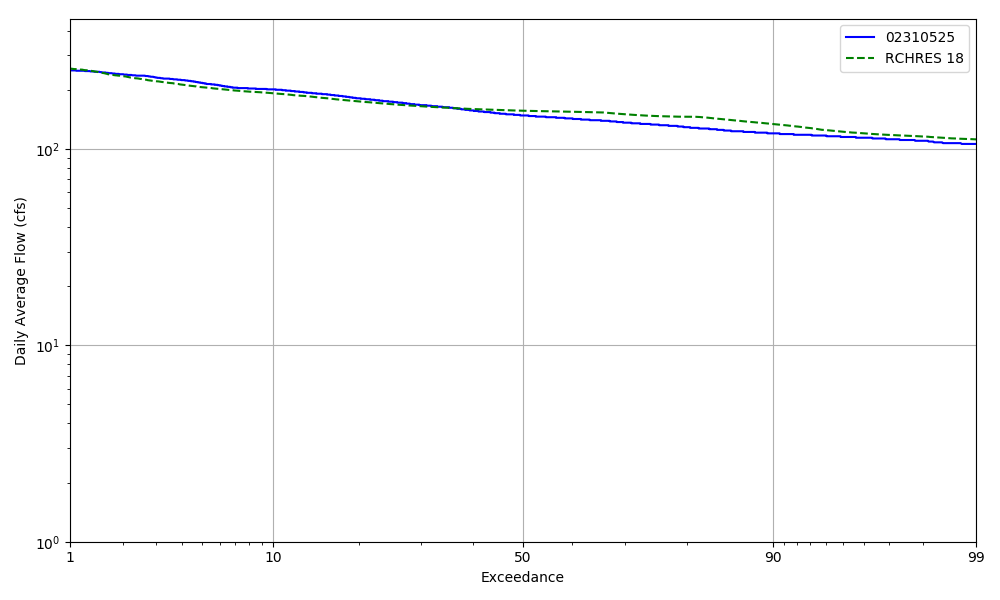


Figure 03100207-17: Daily exceedance for HSFP reach 18 and USGS station 02310525.

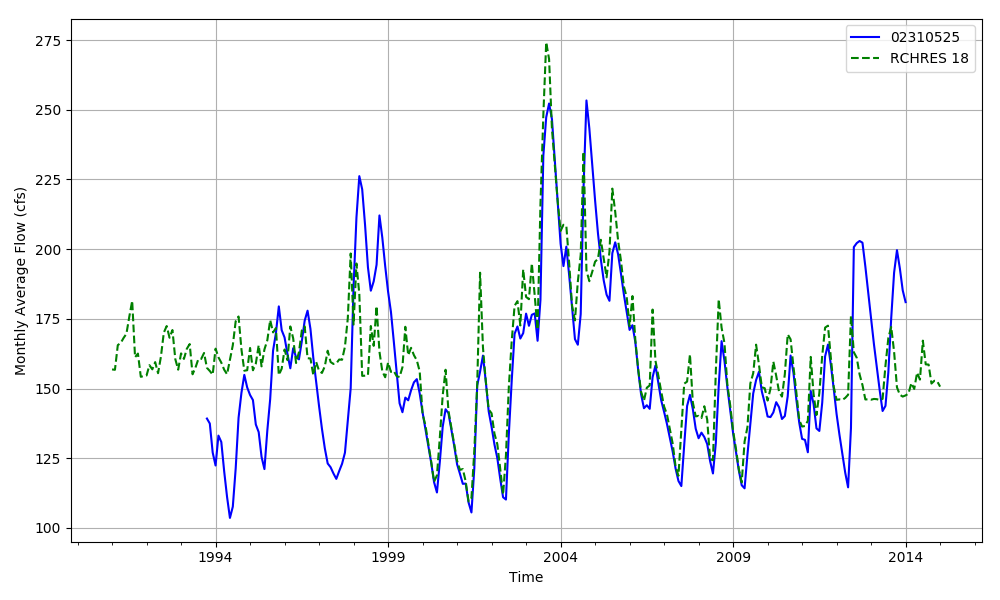


Figure 03100207-18: Monthly flow for HSFP reach 18 and USGS station 02310525.

## HSPF Reach 19, USGS Gauge 02310545

Table 03100207-11: Comparison Statistics Between HSPF Reach 19 and USGS Gauge 02310545.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | -3.44 |
| Standard error | 28.36 |
| Relative bias | -0.02 |
| Relative standard error | 0.67 |
| Nash-Sutcliffe coefficient | 0.55 |
| Coefficient of efficiency | 0.35 |
| Index of agreement | 0.65 |

Table 03100207-12: Hydrologic Indices Between USGS Gauge 02310545 and HSPF Reach 19.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02310545 | Simulated Reach 19 | Percent Difference |
| MA1: Mean, all daily flows | 173.45 | 170.20 | -1.87 |
| MA2: Median, all daily flows | 165.00 | 159.49 | -3.34 |
| MA3: CV, all daily flows | 14.26 | 18.36 | 28.77 |
| MA4: CV, log of all daily flows | 23.66 | 19.77 | -16.44 |
| MA5: Mean daily flow / median daily flow | 1.05 | 1.07 | 1.52 |
| MA9: (Q10 - Q90) / median daily flow | 0.68 | 0.58 | -15.00 |
| MA10: (Q20 - Q80) / median daily flow | 0.48 | 0.35 | -25.51 |
| MA11: (Q25 - Q75) / median daily flow | 0.39 | 0.29 | -27.07 |
| MA12: Mean monthly flow, January | 169.31 | 156.99 | -7.28 |
| MA13: Mean monthly flow, February | 166.00 | 158.68 | -4.41 |
| MA14: Mean monthly flow, March | 164.43 | 161.50 | -1.78 |
| MA15: Mean monthly flow, April | 161.43 | 155.51 | -3.66 |
| MA16: Mean monthly flow, May | 143.04 | 136.14 | -4.82 |
| MA17: Mean monthly flow, June | 149.77 | 150.55 | 0.52 |
| MA18: Mean monthly flow, July | 151.23 | 160.71 | 6.27 |
| MA19: Mean monthly flow, August | 170.68 | 183.78 | 7.68 |
| MA20: Mean monthly flow, September | 179.25 | 190.30 | 6.17 |
| MA21: Mean monthly flow, October | 176.22 | 166.19 | -5.69 |
| MA22: Mean monthly flow, November | 180.28 | 164.81 | -8.58 |
| MA23: Mean monthly flow, December | 175.63 | 162.62 | -7.41 |
| ML1: Mean minimum monthly flow, January | 146.69 | 151.48 | 3.26 |
| ML2: Mean minimum monthly flow, February | 140.23 | 150.37 | 7.23 |
| ML3: Mean minimum monthly flow, March | 140.62 | 150.63 | 7.12 |
| ML4: Mean minimum monthly flow, April | 140.00 | 146.25 | 4.46 |
| ML5: Mean minimum monthly flow, May | 137.00 | 138.67 | 1.22 |
| ML6: Mean minimum monthly flow, June | 137.75 | 139.93 | 1.58 |
| ML7: Mean minimum monthly flow, July | 160.09 | 158.96 | -0.71 |
| ML8: Mean minimum monthly flow, August | 164.67 | 170.54 | 3.57 |
| ML9: Mean minimum monthly flow, September | 166.25 | 175.99 | 5.86 |
| ML10: Mean minimum monthly flow, October | 168.33 | 169.75 | 0.84 |
| ML11: Mean minimum monthly flow, November | 152.38 | 159.80 | 4.87 |
| ML12: Mean minimum monthly flow, December | 140.08 | 154.14 | 10.04 |
| ML13: CV of minimum monthly flows | 27.61 | 19.19 | -30.50 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.69 | 0.85 | 23.71 |
| ML15: Mean minimum annual flow / mean annual flow | 0.67 | 0.81 | 20.50 |
| ML16: Median minimum annual flow / median annual flow | 0.72 | 0.81 | 13.36 |
| ML20: Ratio of baseflow volume to total flow volume | 0.92 | 0.95 | 3.07 |
| ML22: Mean annual minimum flow divided by catchment area | 1.19 | 1.37 | 15.35 |
| RA1: Mean of positive changes from one day to next (rise rate) | 11.13 | 14.76 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 159.94 | 210.30 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 9.32 | 3.50 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 134.71 | 266.07 |  |
| RA5: Ratio of days that are higher than previous day | 0.43 | 0.19 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.04 | 0.03 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.04 | 0.00 |  |
| RA8: Number of flow reversals from one day to the next | 165.85 | 78.23 |  |
| RA9: CV, number of flow reversals from one day to the next | 14.63 | 25.29 |  |

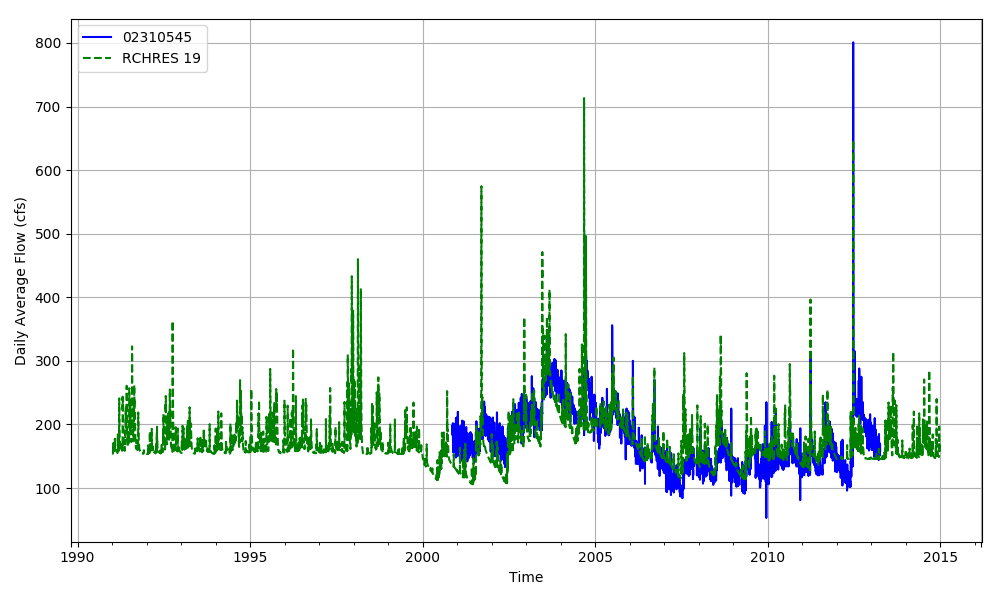


Figure 03100207-19: Daily flow for HSFP reach 19 and USGS station 02310545.

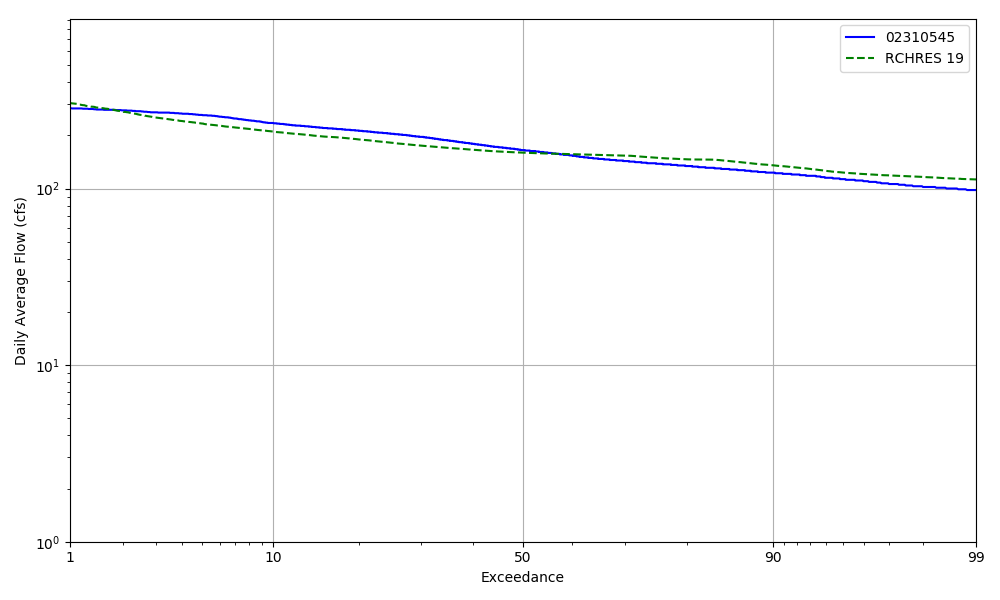


Figure 03100207-20: Daily exceedance for HSFP reach 19 and USGS station 02310545.

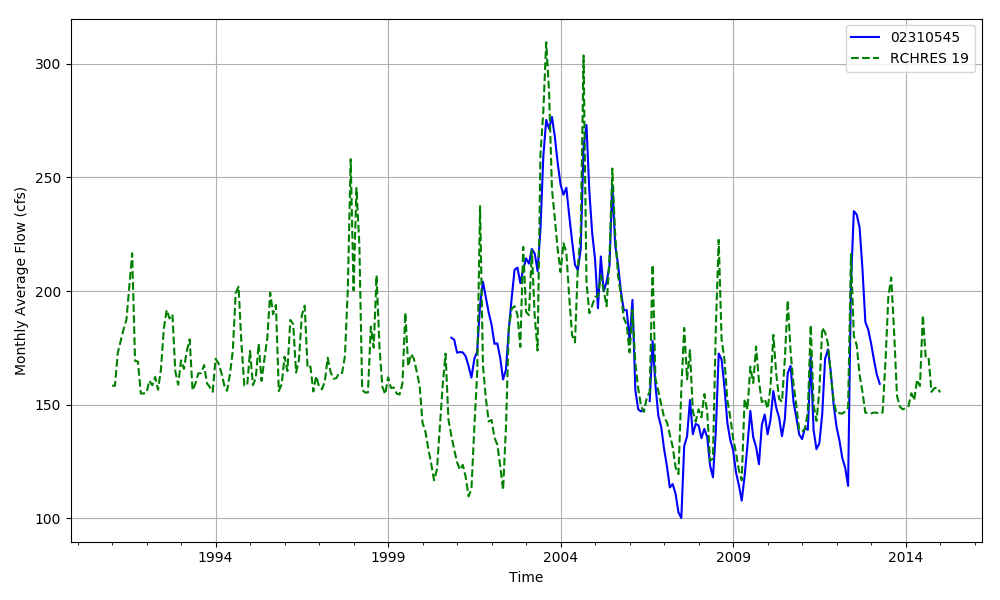


Figure 03100207-21: Monthly flow for HSFP reach 19 and USGS station 02310545.

## HSPF Reach 27, USGS Gauge 02310000

Table 03100207-13: Comparison Statistics Between HSPF Reach 27 and USGS Gauge 02310000.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | -5.21 |
| Standard error | 68.01 |
| Relative bias | -0.09 |
| Relative standard error | 0.60 |
| Nash-Sutcliffe coefficient | 0.65 |
| Coefficient of efficiency | 0.53 |
| Index of agreement | 0.73 |

Table 03100207-14: Hydrologic Indices Between USGS Gauge 02310000 and HSPF Reach 27.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02310000 | Simulated Reach 27 | Percent Difference |
| MA1: Mean, all daily flows | 58.36 | 53.08 | -9.05 |
| MA2: Median, all daily flows | 6.90 | 19.77 | 186.52 |
| MA3: CV, all daily flows | 199.56 | 152.59 | -23.54 |
| MA4: CV, log of all daily flows | 188.63 | 129.62 | -31.28 |
| MA5: Mean daily flow / median daily flow | 8.46 | 2.69 | -68.26 |
| MA9: (Q10 - Q90) / median daily flow | 18.80 | 6.03 | -67.93 |
| MA10: (Q20 - Q80) / median daily flow | 7.39 | 3.04 | -58.86 |
| MA11: (Q25 - Q75) / median daily flow | 4.88 | 2.35 | -51.97 |
| MA12: Mean monthly flow, January | 33.89 | 35.90 | 5.92 |
| MA13: Mean monthly flow, February | 37.72 | 43.54 | 15.42 |
| MA14: Mean monthly flow, March | 47.11 | 36.80 | -21.90 |
| MA15: Mean monthly flow, April | 32.09 | 27.30 | -14.92 |
| MA16: Mean monthly flow, May | 6.61 | 13.98 | 111.52 |
| MA17: Mean monthly flow, June | 44.35 | 46.00 | 3.72 |
| MA18: Mean monthly flow, July | 84.00 | 86.79 | 3.31 |
| MA19: Mean monthly flow, August | 132.97 | 101.89 | -23.37 |
| MA20: Mean monthly flow, September | 139.42 | 106.18 | -23.84 |
| MA21: Mean monthly flow, October | 49.78 | 42.41 | -14.80 |
| MA22: Mean monthly flow, November | 13.74 | 22.36 | 62.76 |
| MA23: Mean monthly flow, December | 48.58 | 46.97 | -3.30 |
| ML1: Mean minimum monthly flow, January | 10.92 | 10.44 | -4.41 |
| ML2: Mean minimum monthly flow, February | 11.33 | 13.97 | 23.28 |
| ML3: Mean minimum monthly flow, March | 14.45 | 13.43 | -7.04 |
| ML4: Mean minimum monthly flow, April | 5.23 | 7.47 | 42.95 |
| ML5: Mean minimum monthly flow, May | 2.95 | 5.11 | 73.43 |
| ML6: Mean minimum monthly flow, June | 3.08 | 8.24 | 167.63 |
| ML7: Mean minimum monthly flow, July | 19.70 | 34.10 | 73.09 |
| ML8: Mean minimum monthly flow, August | 32.62 | 34.08 | 4.49 |
| ML9: Mean minimum monthly flow, September | 27.12 | 28.70 | 5.85 |
| ML10: Mean minimum monthly flow, October | 10.87 | 11.26 | 3.57 |
| ML11: Mean minimum monthly flow, November | 6.16 | 8.41 | 36.57 |
| ML12: Mean minimum monthly flow, December | 6.00 | 10.33 | 72.30 |
| ML13: CV of minimum monthly flows | 185.09 | 117.90 | -36.30 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.31 | 0.15 | -50.78 |
| ML15: Mean minimum annual flow / mean annual flow | 0.09 | 0.07 | -27.85 |
| ML16: Median minimum annual flow / median annual flow | 0.30 | 0.13 | -55.41 |
| ML20: Ratio of baseflow volume to total flow volume | 0.34 | 0.41 | 20.87 |
| ML22: Mean annual minimum flow divided by catchment area | 0.03 | 0.03 | 23.71 |
| RA1: Mean of positive changes from one day to next (rise rate) | 29.00 | 25.25 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 362.84 | 339.99 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 13.07 | 7.31 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 356.24 | 366.68 |  |
| RA5: Ratio of days that are higher than previous day | 0.26 | 0.22 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.13 | 0.16 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.09 | 0.08 |  |
| RA8: Number of flow reversals from one day to the next | 81.54 | 70.08 |  |
| RA9: CV, number of flow reversals from one day to the next | 25.12 | 21.04 |  |

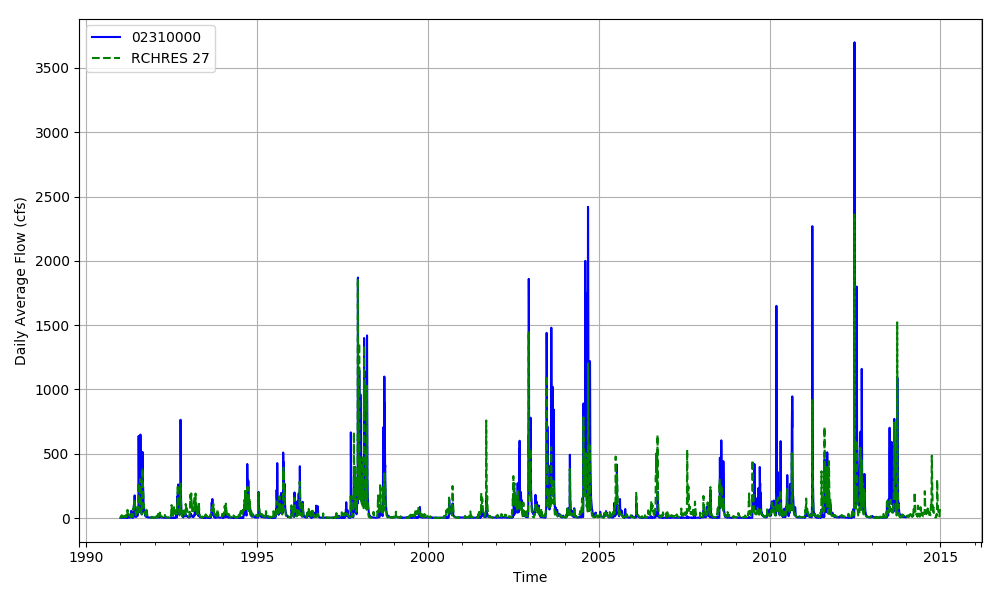


Figure 03100207-22: Daily flow for HSFP reach 27 and USGS station 02310000.

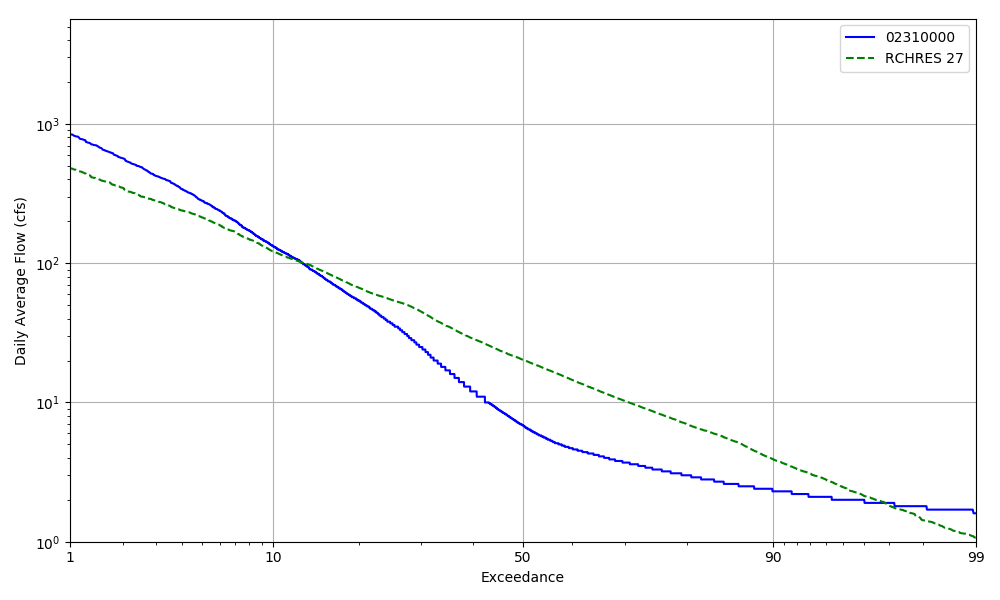


Figure 03100207-23: Daily exceedance for HSFP reach 27 and USGS station 02310000.

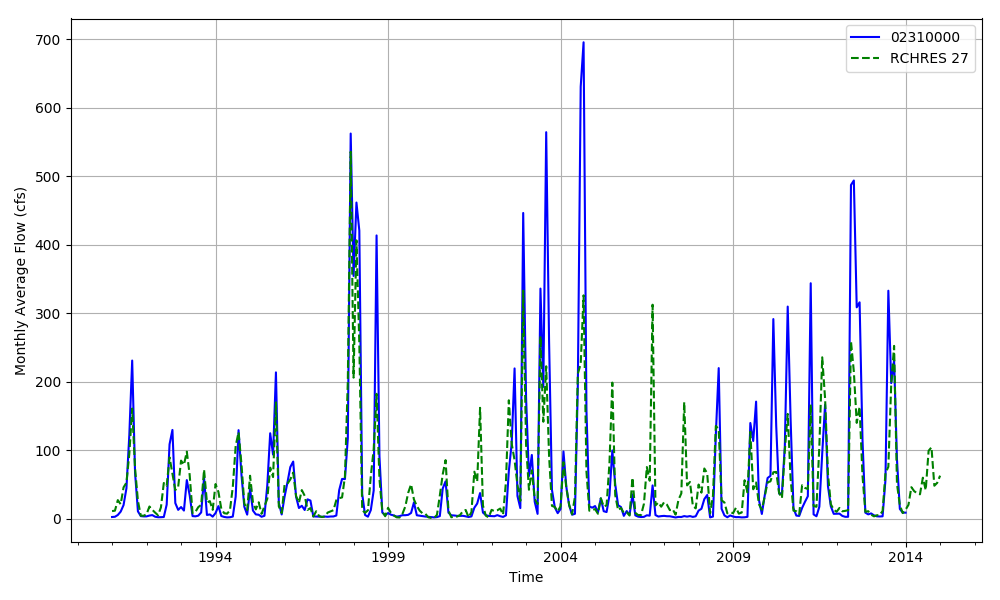


Figure 03100207-24: Monthly flow for HSFP reach 27 and USGS station 02310000.

## HSPF Reach 29, USGS Gauge 02309421

Table 03100207-15: Comparison Statistics Between HSPF Reach 29 and USGS Gauge 02309421.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | -6.37 |
| Standard error | 7.45 |
| Relative bias | -0.67 |
| Relative standard error | 1.16 |
| Nash-Sutcliffe coefficient | -0.35 |
| Coefficient of efficiency | -0.28 |
| Index of agreement | 0.45 |

Table 03100207-16: Hydrologic Indices Between USGS Gauge 02309421 and HSPF Reach 29.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02309421 | Simulated Reach 29 | Percent Difference |
| MA1: Mean, all daily flows | 9.51 | 3.12 | -67.24 |
| MA2: Median, all daily flows | 5.40 | 1.09 | -79.83 |
| MA3: CV, all daily flows | 141.04 | 171.14 | 21.34 |
| MA4: CV, log of all daily flows | 86.60 | 130.89 | 51.14 |
| MA5: Mean daily flow / median daily flow | 1.76 | 2.86 | 62.40 |
| MA9: (Q10 - Q90) / median daily flow | 2.98 | 6.84 | 129.30 |
| MA10: (Q20 - Q80) / median daily flow | 1.41 | 3.80 | 170.34 |
| MA11: (Q25 - Q75) / median daily flow | 1.08 | 2.86 | 164.09 |
| MA12: Mean monthly flow, January | 5.75 | 1.63 | -71.73 |
| MA13: Mean monthly flow, February | 5.50 | 1.69 | -69.33 |
| MA14: Mean monthly flow, March | 5.43 | 1.64 | -69.85 |
| MA15: Mean monthly flow, April | 5.09 | 1.72 | -66.18 |
| MA16: Mean monthly flow, May | 4.55 | 1.08 | -76.32 |
| MA17: Mean monthly flow, June | 11.55 | 4.55 | -60.57 |
| MA18: Mean monthly flow, July | 15.68 | 6.01 | -61.69 |
| MA19: Mean monthly flow, August | 16.98 | 6.04 | -64.44 |
| MA20: Mean monthly flow, September | 13.56 | 4.77 | -64.80 |
| MA21: Mean monthly flow, October | 7.48 | 1.63 | -78.15 |
| MA22: Mean monthly flow, November | 4.64 | 0.75 | -83.75 |
| MA23: Mean monthly flow, December | 5.76 | 1.85 | -67.96 |
| ML1: Mean minimum monthly flow, January | 3.39 | 0.18 | -94.61 |
| ML2: Mean minimum monthly flow, February | 3.89 | 0.40 | -89.71 |
| ML3: Mean minimum monthly flow, March | 3.48 | 0.42 | -87.89 |
| ML4: Mean minimum monthly flow, April | 2.82 | 0.21 | -92.49 |
| ML5: Mean minimum monthly flow, May | 2.86 | 0.17 | -94.14 |
| ML6: Mean minimum monthly flow, June | 3.17 | 0.43 | -86.40 |
| ML7: Mean minimum monthly flow, July | 5.62 | 1.88 | -66.62 |
| ML8: Mean minimum monthly flow, August | 6.89 | 1.93 | -72.04 |
| ML9: Mean minimum monthly flow, September | 5.74 | 1.02 | -82.15 |
| ML10: Mean minimum monthly flow, October | 4.47 | 0.29 | -93.54 |
| ML11: Mean minimum monthly flow, November | 3.52 | 0.17 | -95.09 |
| ML12: Mean minimum monthly flow, December | 3.16 | 0.15 | -95.11 |
| ML13: CV of minimum monthly flows | 44.59 | 127.52 | 185.98 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.41 | 0.04 | -89.58 |
| ML15: Mean minimum annual flow / mean annual flow | 0.25 | 0.01 | -94.41 |
| ML16: Median minimum annual flow / median annual flow | 0.41 | 0.00 | -99.48 |
| ML20: Ratio of baseflow volume to total flow volume | 0.49 | 0.27 | -45.17 |
| ML22: Mean annual minimum flow divided by catchment area | 0.02 | 0.00 | -98.55 |
| RA1: Mean of positive changes from one day to next (rise rate) | 8.98 | 4.53 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 236.46 | 198.08 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 3.86 | 1.17 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 313.89 | 342.92 |  |
| RA5: Ratio of days that are higher than previous day | 0.26 | 0.20 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.22 | 0.46 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.10 | 0.13 |  |
| RA8: Number of flow reversals from one day to the next | 110.15 | 82.92 |  |
| RA9: CV, number of flow reversals from one day to the next | 29.51 | 30.94 |  |

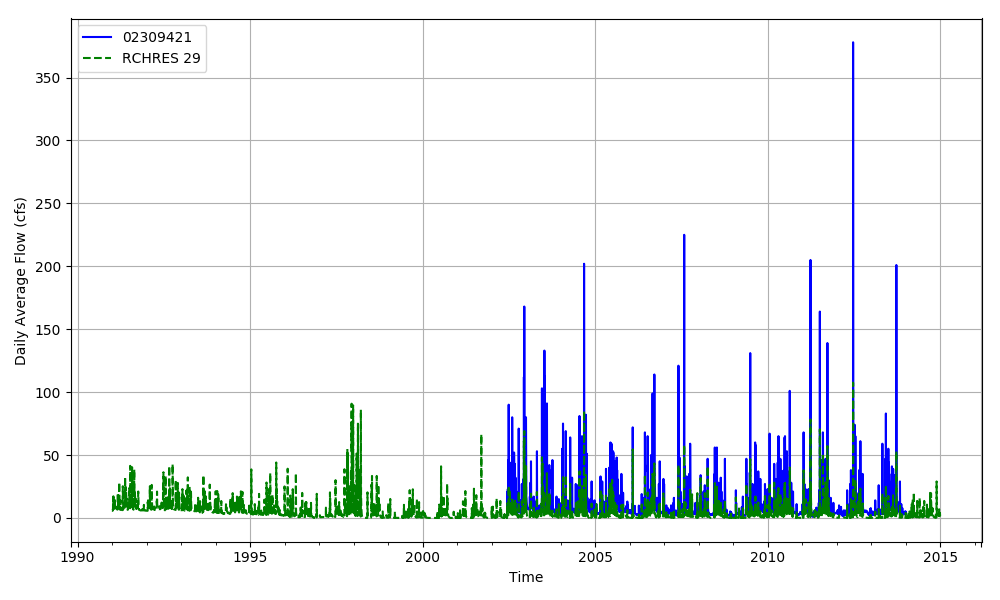


Figure 03100207-25: Daily flow for HSFP reach 29 and USGS station 02309421.

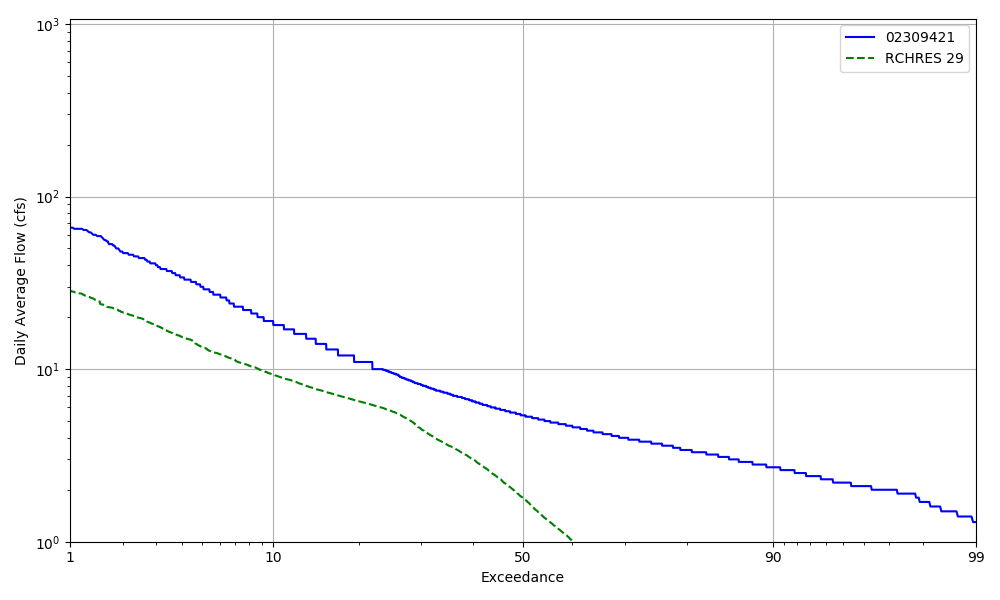


Figure 03100207-26: Daily exceedance for HSFP reach 29 and USGS station 02309421.

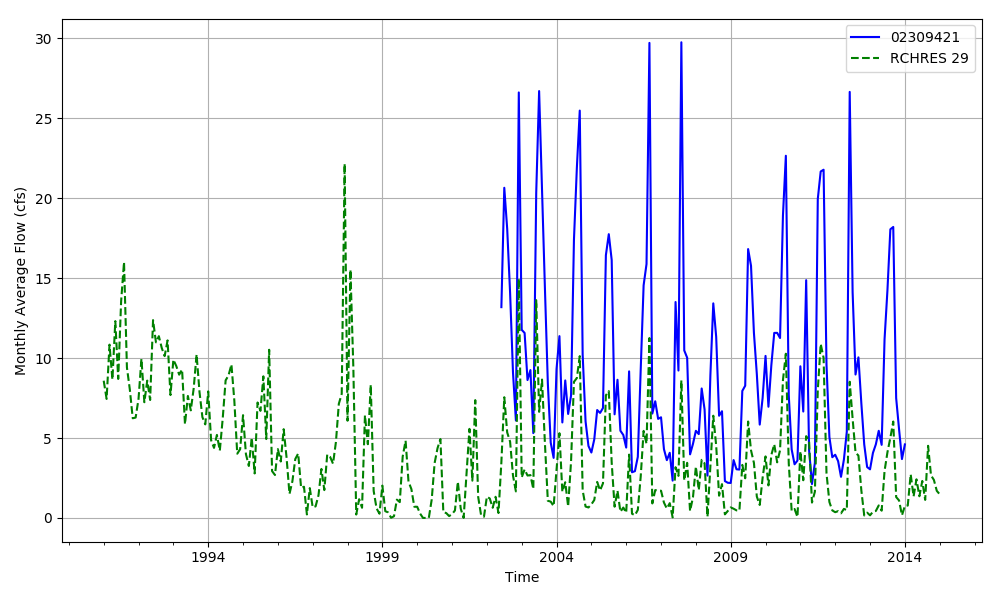


Figure 03100207-27: Monthly flow for HSFP reach 29 and USGS station 02309421.

## HSPF Reach 32, USGS Gauge 02309425

Table 03100207-17: Comparison Statistics Between HSPF Reach 32 and USGS Gauge 02309425.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | 3.85 |
| Standard error | 11.85 |
| Relative bias | 0.24 |
| Relative standard error | 0.87 |
| Nash-Sutcliffe coefficient | 0.24 |
| Coefficient of efficiency | 0.30 |
| Index of agreement | 0.71 |

Table 03100207-18: Hydrologic Indices Between USGS Gauge 02309425 and HSPF Reach 32.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02309425 | Simulated Reach 32 | Percent Difference |
| MA1: Mean, all daily flows | 16.03 | 19.97 | 24.53 |
| MA2: Median, all daily flows | 7.70 | 6.90 | -10.44 |
| MA3: CV, all daily flows | 165.93 | 157.94 | -4.81 |
| MA4: CV, log of all daily flows | 96.76 | 132.48 | 36.91 |
| MA5: Mean daily flow / median daily flow | 2.08 | 2.90 | 39.04 |
| MA9: (Q10 - Q90) / median daily flow | 3.87 | 7.58 | 95.79 |
| MA10: (Q20 - Q80) / median daily flow | 2.18 | 4.10 | 87.70 |
| MA11: (Q25 - Q75) / median daily flow | 1.61 | 3.09 | 91.63 |
| MA12: Mean monthly flow, January | 9.64 | 7.61 | -20.99 |
| MA13: Mean monthly flow, February | 8.76 | 9.05 | 3.27 |
| MA14: Mean monthly flow, March | 8.88 | 9.51 | 7.14 |
| MA15: Mean monthly flow, April | 9.14 | 11.16 | 21.99 |
| MA16: Mean monthly flow, May | 5.59 | 6.14 | 9.74 |
| MA17: Mean monthly flow, June | 18.44 | 25.43 | 37.95 |
| MA18: Mean monthly flow, July | 28.54 | 43.13 | 51.10 |
| MA19: Mean monthly flow, August | 30.76 | 44.85 | 45.79 |
| MA20: Mean monthly flow, September | 26.18 | 32.67 | 24.80 |
| MA21: Mean monthly flow, October | 11.74 | 11.02 | -6.14 |
| MA22: Mean monthly flow, November | 6.67 | 5.07 | -23.96 |
| MA23: Mean monthly flow, December | 9.45 | 9.98 | 5.63 |
| ML1: Mean minimum monthly flow, January | 4.66 | 1.04 | -77.69 |
| ML2: Mean minimum monthly flow, February | 5.28 | 2.22 | -57.96 |
| ML3: Mean minimum monthly flow, March | 4.91 | 2.73 | -44.39 |
| ML4: Mean minimum monthly flow, April | 3.81 | 1.92 | -49.52 |
| ML5: Mean minimum monthly flow, May | 2.74 | 1.51 | -45.10 |
| ML6: Mean minimum monthly flow, June | 3.71 | 3.53 | -4.68 |
| ML7: Mean minimum monthly flow, July | 8.76 | 15.24 | 73.93 |
| ML8: Mean minimum monthly flow, August | 9.99 | 15.66 | 56.70 |
| ML9: Mean minimum monthly flow, September | 8.59 | 7.73 | -10.09 |
| ML10: Mean minimum monthly flow, October | 5.33 | 2.13 | -60.04 |
| ML11: Mean minimum monthly flow, November | 4.50 | 1.26 | -72.00 |
| ML12: Mean minimum monthly flow, December | 4.14 | 1.23 | -70.28 |
| ML13: CV of minimum monthly flows | 63.31 | 135.46 | 113.98 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.34 | 0.08 | -75.95 |
| ML15: Mean minimum annual flow / mean annual flow | 0.17 | 0.04 | -75.32 |
| ML16: Median minimum annual flow / median annual flow | 0.32 | 0.05 | -85.22 |
| ML20: Ratio of baseflow volume to total flow volume | 0.43 | 0.33 | -23.46 |
| ML22: Mean annual minimum flow divided by catchment area | 0.03 | 0.01 | -55.39 |
| RA1: Mean of positive changes from one day to next (rise rate) | 15.93 | 22.16 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 253.34 | 210.32 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 5.68 | 6.71 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 337.31 | 315.66 |  |
| RA5: Ratio of days that are higher than previous day | 0.24 | 0.23 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.25 | 0.31 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.11 | 0.12 |  |
| RA8: Number of flow reversals from one day to the next | 106.81 | 92.56 |  |
| RA9: CV, number of flow reversals from one day to the next | 34.94 | 33.00 |  |

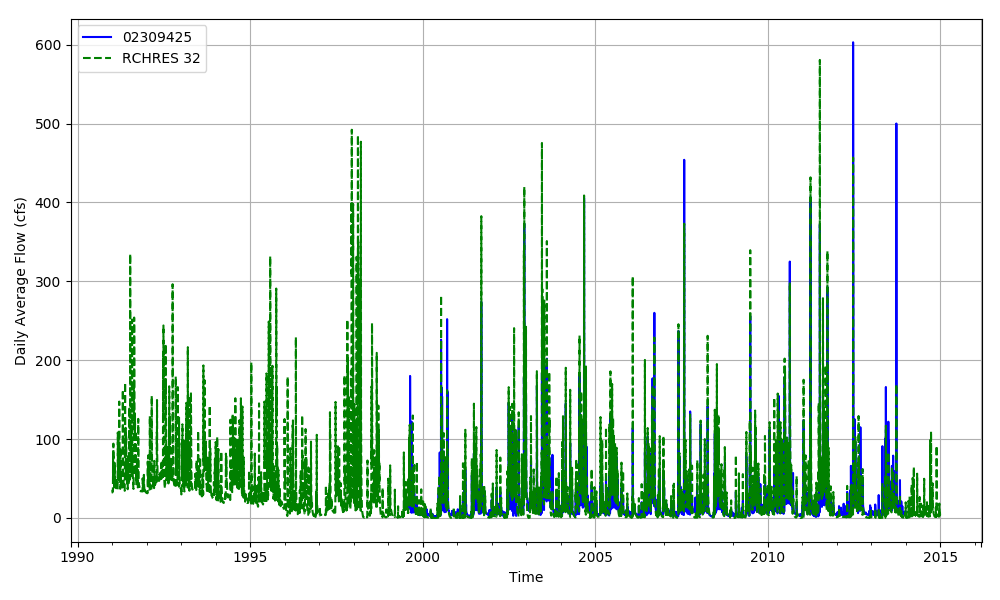


Figure 03100207-28: Daily flow for HSFP reach 32 and USGS station 02309425.

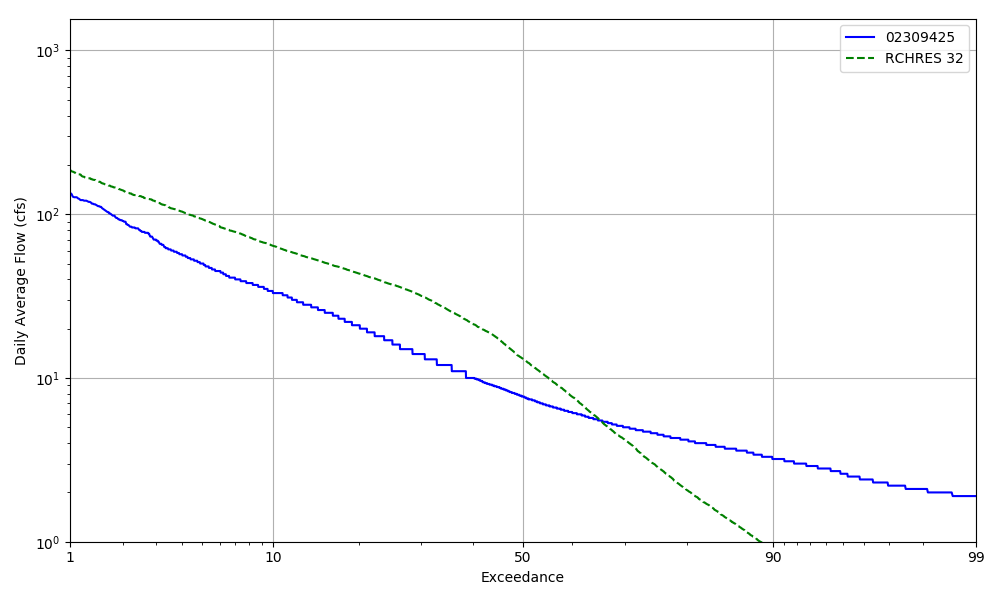


Figure 03100207-29: Daily exceedance for HSFP reach 32 and USGS station 02309425.

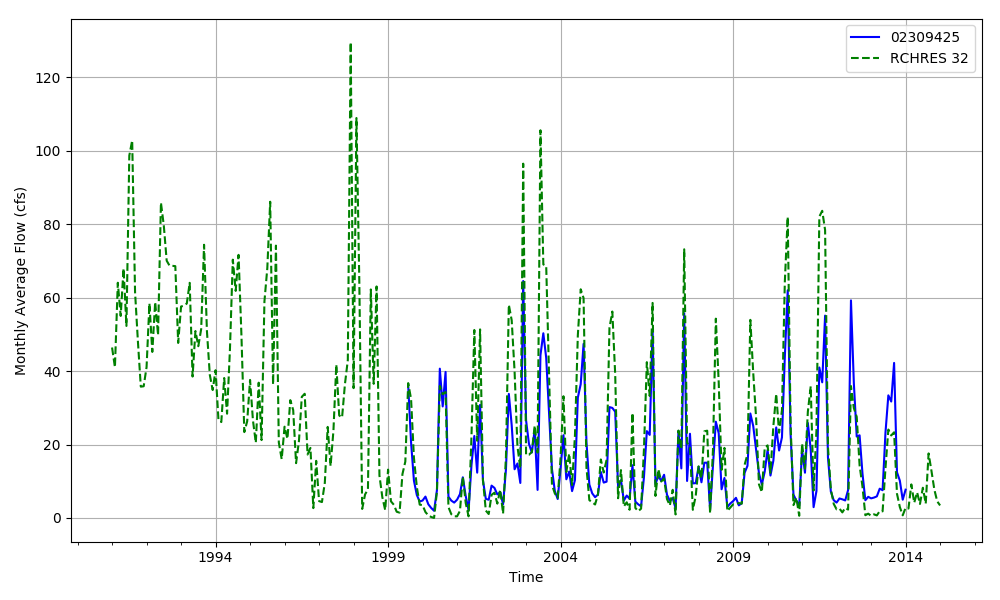


Figure 03100207-30: Monthly flow for HSFP reach 32 and USGS station 02309425.

## HSPF Reach 40, USGS Gauge 02310280

Table 03100207-19: Comparison Statistics Between HSPF Reach 40 and USGS Gauge 02310280.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | 9.58 |
| Standard error | 20.57 |
| Relative bias | 2.11 |
| Relative standard error | 2.40 |
| Nash-Sutcliffe coefficient | -4.76 |
| Coefficient of efficiency | -0.99 |
| Index of agreement | 0.41 |

Table 03100207-20: Hydrologic Indices Between USGS Gauge 02310280 and HSPF Reach 40.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02310280 | Simulated Reach 40 | Percent Difference |
| MA1: Mean, all daily flows | 4.56 | 14.15 | 210.04 |
| MA2: Median, all daily flows | 1.10 | 2.60 | 136.14 |
| MA3: CV, all daily flows | 148.07 | 187.61 | 26.70 |
| MA4: CV, log of all daily flows | 163.22 | 163.70 | 0.30 |
| MA5: Mean daily flow / median daily flow | 4.15 | 5.45 | 31.30 |
| MA9: (Q10 - Q90) / median daily flow | 10.91 | 13.80 | 26.51 |
| MA10: (Q20 - Q80) / median daily flow | 4.85 | 6.64 | 36.71 |
| MA11: (Q25 - Q75) / median daily flow | 3.50 | 4.67 | 33.55 |
| MA12: Mean monthly flow, January | 4.61 | 12.44 | 169.62 |
| MA13: Mean monthly flow, February | 4.26 | 14.38 | 237.36 |
| MA14: Mean monthly flow, March | 4.60 | 11.48 | 149.80 |
| MA15: Mean monthly flow, April | 2.13 | 6.62 | 210.28 |
| MA16: Mean monthly flow, May | 0.47 | 3.03 | 550.40 |
| MA17: Mean monthly flow, June | 2.04 | 15.66 | 666.87 |
| MA18: Mean monthly flow, July | 6.34 | 19.10 | 201.11 |
| MA19: Mean monthly flow, August | 9.06 | 23.90 | 163.86 |
| MA20: Mean monthly flow, September | 9.01 | 26.52 | 194.46 |
| MA21: Mean monthly flow, October | 4.93 | 11.27 | 128.66 |
| MA22: Mean monthly flow, November | 1.42 | 5.42 | 280.62 |
| MA23: Mean monthly flow, December | 3.58 | 13.17 | 267.49 |
| ML1: Mean minimum monthly flow, January | 1.96 | 2.14 | 9.41 |
| ML2: Mean minimum monthly flow, February | 1.99 | 2.21 | 11.50 |
| ML3: Mean minimum monthly flow, March | 2.06 | 2.77 | 34.20 |
| ML4: Mean minimum monthly flow, April | 0.35 | 0.68 | 93.33 |
| ML5: Mean minimum monthly flow, May | 0.02 | 0.38 | 2250.06 |
| ML6: Mean minimum monthly flow, June | 0.04 | 0.52 | 1222.43 |
| ML7: Mean minimum monthly flow, July | 1.62 | 4.76 | 194.03 |
| ML8: Mean minimum monthly flow, August | 3.47 | 4.12 | 18.90 |
| ML9: Mean minimum monthly flow, September | 2.17 | 3.04 | 40.01 |
| ML10: Mean minimum monthly flow, October | 1.15 | 1.61 | 39.99 |
| ML11: Mean minimum monthly flow, November | 0.62 | 1.55 | 148.75 |
| ML12: Mean minimum monthly flow, December | 0.88 | 2.91 | 231.12 |
| ML13: CV of minimum monthly flows | 258.05 | 237.33 | -8.03 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.02 | 0.06 | 185.68 |
| ML15: Mean minimum annual flow / mean annual flow | 0.01 | 0.02 | 168.02 |
| ML16: Median minimum annual flow / median annual flow | 0.00 | 0.02 |  |
| ML20: Ratio of baseflow volume to total flow volume | 0.47 | 0.25 | -47.26 |
| ML22: Mean annual minimum flow divided by catchment area | 0.00 | 0.00 | 725.38 |
| RA1: Mean of positive changes from one day to next (rise rate) | 2.22 | 8.66 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 254.64 | 362.88 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 0.76 | 3.25 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 217.61 | 388.61 |  |
| RA5: Ratio of days that are higher than previous day | 0.20 | 0.27 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.33 | 0.26 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.14 | 0.17 |  |
| RA8: Number of flow reversals from one day to the next | 68.25 | 86.08 |  |
| RA9: CV, number of flow reversals from one day to the next | 23.26 | 18.16 |  |

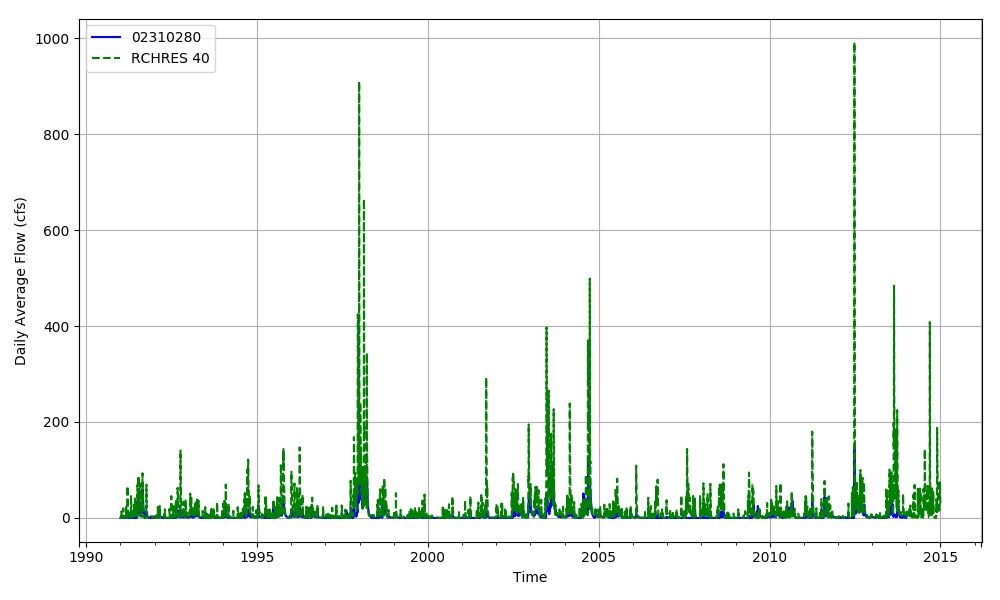


Figure 03100207-31: Daily flow for HSFP reach 40 and USGS station 02310280.

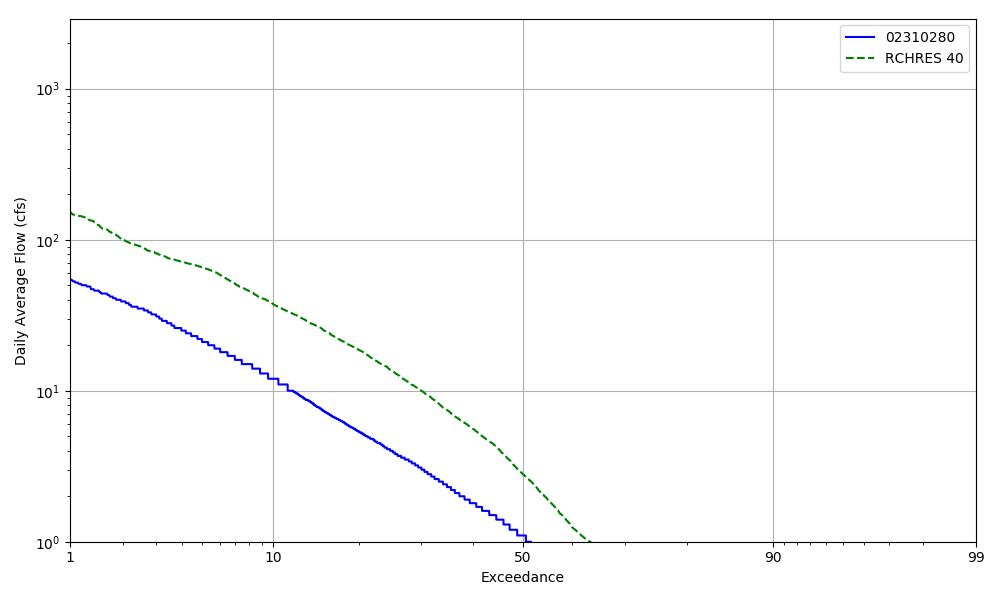


Figure 03100207-32: Daily exceedance for HSFP reach 40 and USGS station 02310280.

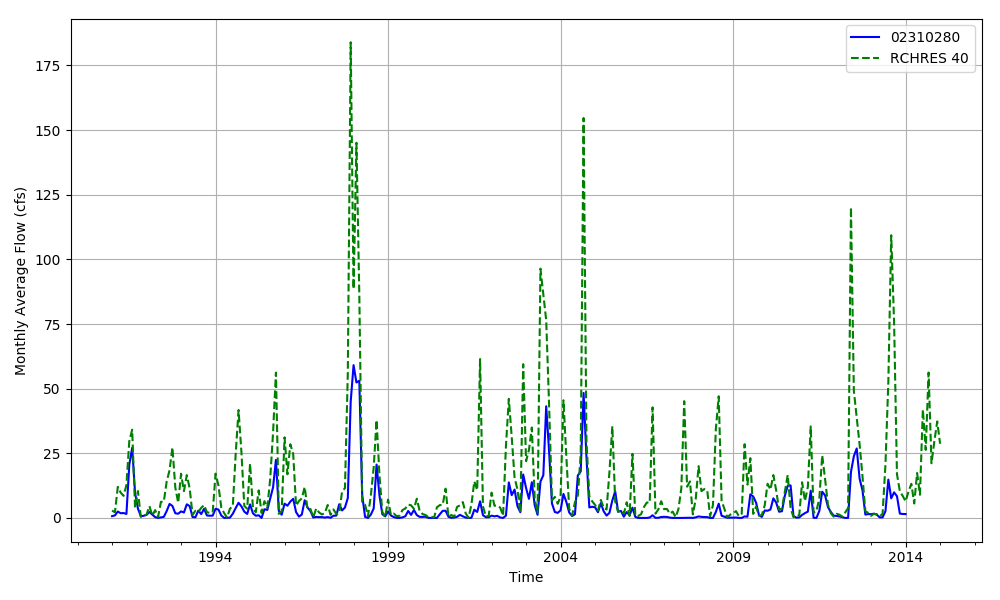


Figure 03100207-33: Monthly flow for HSFP reach 40 and USGS station 02310280.

## HSPF Reach 41, USGS Gauge 02310300

Table 03100207-21: Comparison Statistics Between HSPF Reach 41 and USGS Gauge 02310300.

|  |  |
| --- | --- |
| Statistic | Value |
| Bias | 17.73 |
| Standard error | 35.51 |
| Relative bias | 0.86 |
| Relative standard error | 0.88 |
| Nash-Sutcliffe coefficient | 0.23 |
| Coefficient of efficiency | 0.21 |
| Index of agreement | 0.66 |

Table 03100207-22: Hydrologic Indices Between USGS Gauge 02310300 and HSPF Reach 41.

|  |  |  |  |
| --- | --- | --- | --- |
| Hydrologic Index and description (Olden and Poff, 2003) | Observed 02310300 | Simulated Reach 41 | Percent Difference |
| MA1: Mean, all daily flows | 20.76 | 38.54 | 85.63 |
| MA2: Median, all daily flows | 3.60 | 10.36 | 187.89 |
| MA3: CV, all daily flows | 182.67 | 170.80 | -6.50 |
| MA4: CV, log of all daily flows | 183.13 | 147.91 | -19.23 |
| MA5: Mean daily flow / median daily flow | 5.77 | 3.72 | -35.52 |
| MA9: (Q10 - Q90) / median daily flow | 15.55 | 10.51 | -32.38 |
| MA10: (Q20 - Q80) / median daily flow | 6.33 | 4.33 | -31.69 |
| MA11: (Q25 - Q75) / median daily flow | 4.35 | 2.98 | -31.42 |
| MA12: Mean monthly flow, January | 16.14 | 28.29 | 75.33 |
| MA13: Mean monthly flow, February | 15.76 | 33.70 | 113.90 |
| MA14: Mean monthly flow, March | 18.73 | 29.82 | 59.24 |
| MA15: Mean monthly flow, April | 9.81 | 21.72 | 121.49 |
| MA16: Mean monthly flow, May | 1.63 | 8.57 | 424.70 |
| MA17: Mean monthly flow, June | 14.54 | 35.67 | 145.29 |
| MA18: Mean monthly flow, July | 28.64 | 62.85 | 119.47 |
| MA19: Mean monthly flow, August | 43.66 | 73.00 | 67.18 |
| MA20: Mean monthly flow, September | 44.40 | 75.22 | 69.43 |
| MA21: Mean monthly flow, October | 19.52 | 27.70 | 41.90 |
| MA22: Mean monthly flow, November | 6.67 | 13.82 | 107.30 |
| MA23: Mean monthly flow, December | 19.10 | 32.85 | 72.00 |
| ML1: Mean minimum monthly flow, January | 5.48 | 6.89 | 25.60 |
| ML2: Mean minimum monthly flow, February | 5.66 | 8.11 | 43.24 |
| ML3: Mean minimum monthly flow, March | 6.88 | 9.95 | 44.60 |
| ML4: Mean minimum monthly flow, April | 1.44 | 3.54 | 146.22 |
| ML5: Mean minimum monthly flow, May | 0.09 | 2.20 | 2367.47 |
| ML6: Mean minimum monthly flow, June | 0.10 | 3.49 | 3377.13 |
| ML7: Mean minimum monthly flow, July | 5.03 | 20.77 | 313.07 |
| ML8: Mean minimum monthly flow, August | 14.31 | 21.83 | 52.48 |
| ML9: Mean minimum monthly flow, September | 10.59 | 14.75 | 39.30 |
| ML10: Mean minimum monthly flow, October | 3.82 | 5.99 | 56.66 |
| ML11: Mean minimum monthly flow, November | 2.23 | 4.80 | 115.72 |
| ML12: Mean minimum monthly flow, December | 4.34 | 7.68 | 76.84 |
| ML13: CV of minimum monthly flows | 251.90 | 164.25 | -34.80 |
| ML14: Mean minimum daily flow / mean median annual flow | 0.02 | 0.14 | 551.90 |
| ML15: Mean minimum annual flow / mean annual flow | 0.01 | 0.05 | 474.16 |
| ML16: Median minimum annual flow / median annual flow | 0.00 | 0.13 |  |
| ML20: Ratio of baseflow volume to total flow volume | 0.39 | 0.36 | -6.93 |
| ML22: Mean annual minimum flow divided by catchment area | 0.00 | 0.02 | 975.23 |
| RA1: Mean of positive changes from one day to next (rise rate) | 9.90 | 19.26 |  |
| RA2: CV, mean of positive changes from one day to next (rise rate) | 482.54 | 367.68 |  |
| RA3: Mean of negative changes from one day to next (fall rate) | 4.06 | 5.90 |  |
| RA4: CV, mean of negative changes from one day to next (fall rate) | 454.01 | 425.18 |  |
| RA5: Ratio of days that are higher than previous day | 0.25 | 0.23 |  |
| RA6: Median of difference in log of flows over two consecutive days of rising | 0.26 | 0.22 |  |
| RA7: Median of difference in log of flows over two consecutive days of falling | 0.15 | 0.09 |  |
| RA8: Number of flow reversals from one day to the next | 74.04 | 66.08 |  |
| RA9: CV, number of flow reversals from one day to the next | 19.44 | 20.08 |  |

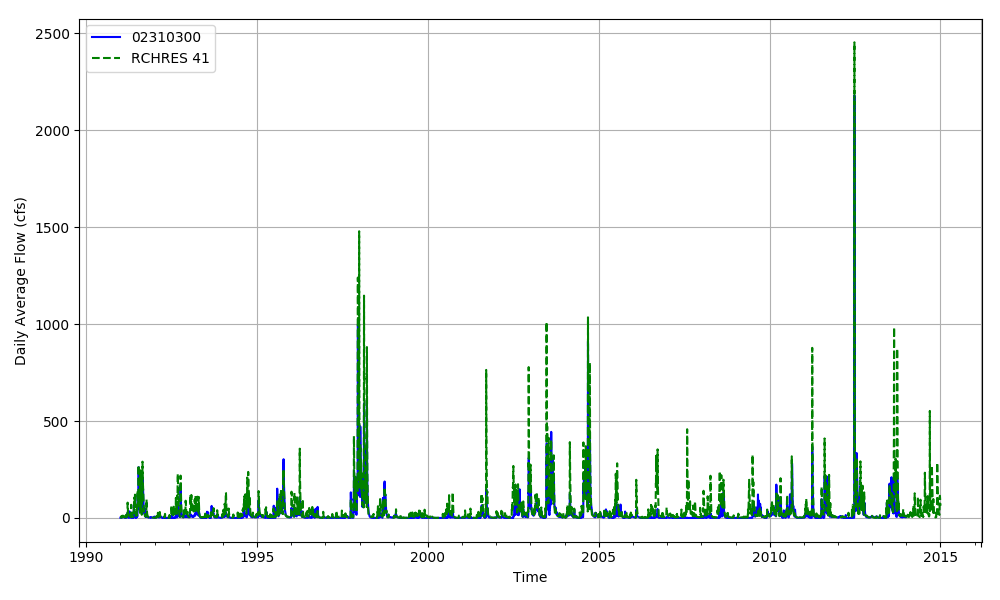


Figure 03100207-34: Daily flow for HSFP reach 41 and USGS station 02310300.

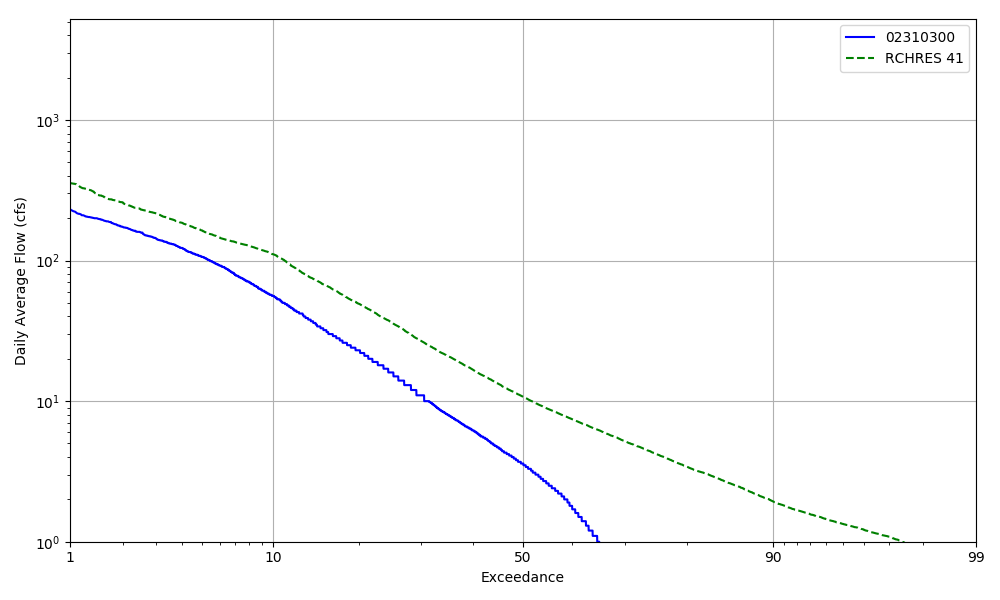


Figure 03100207-35: Daily exceedance for HSFP reach 41 and USGS station 02310300.

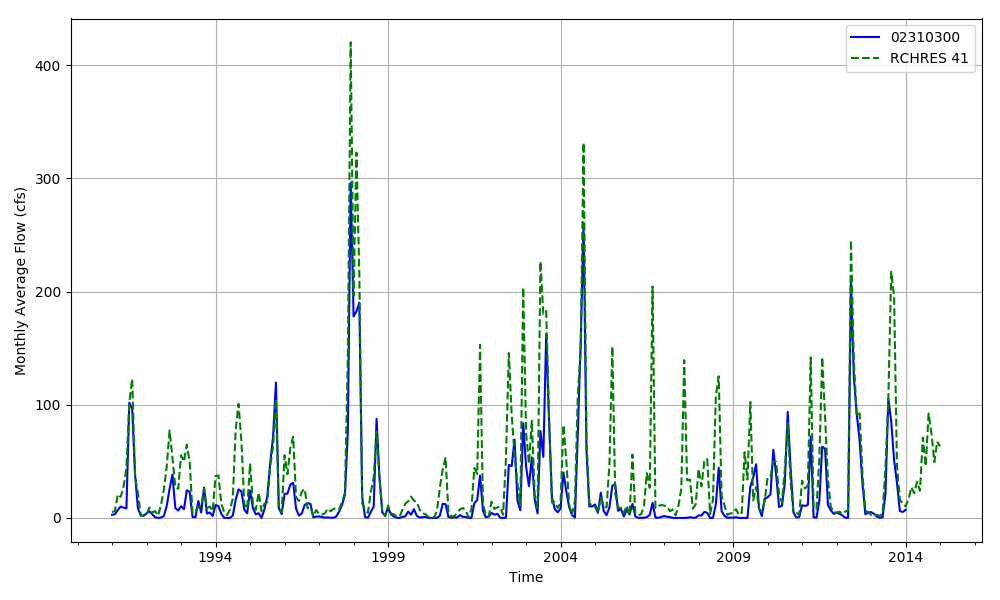


Figure 03100207-36: Monthly flow for HSFP reach 41 and USGS station 02310300.