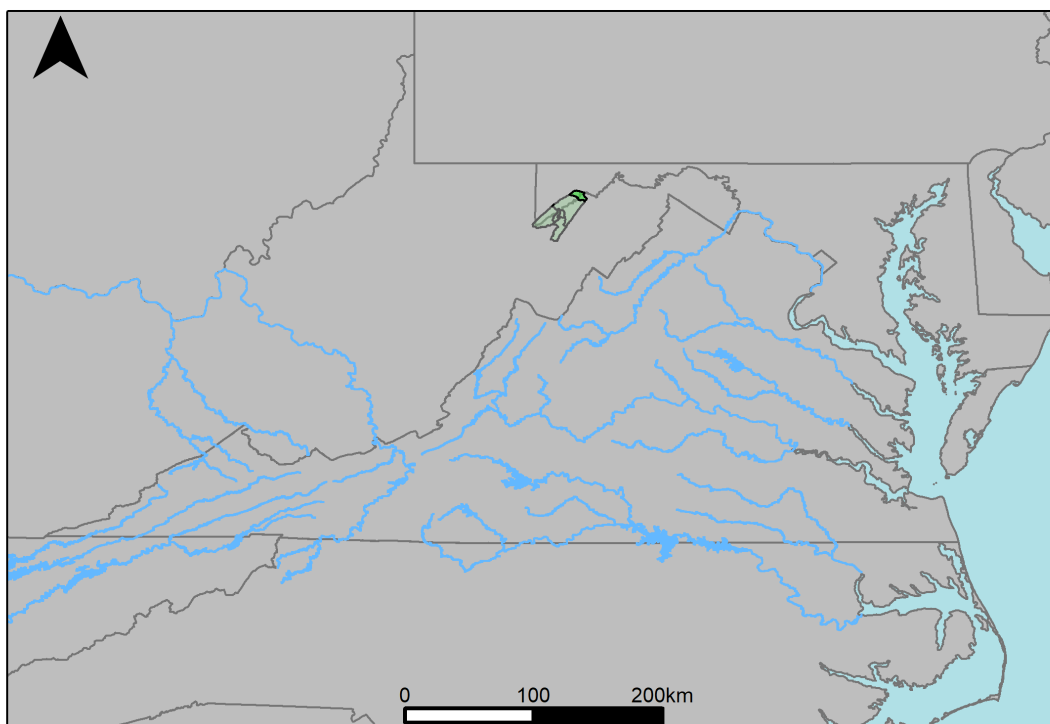


River Segment YP3_6700_6670: USGS Gage 01671020 vs. VA Hydro Run 120



This river segment follows part of the flow of the North Anna River at Hart Corner near Doswell, VA. Gage 01671020 is located in Hanover County, VA (Lat 37° 51' 00", Long 77° 25' 41") approximately 2.1 miles east of Doswell, VA. Drainage area is 462 sq. miles. This gage started taking data in 1979 and has been taking data periodically until now. Diversion at a point 0.8 mi upstream from station since 1973. Maximum discharge, 12,000 cfs, from rating curve extended above 10,100 cfs. The average daily discharge change between scenario 1 and scenario 2 for the 20 year timespan was -22.1123%, with 63.5% of its rolling three month time spans above 20% difference. The Nash-Sutcliffe Efficiency of the model, calculated between the gage and scenario data, was found to be 0.192.

Table 1: Monthly Low Flows

| | Scen. 1 | Scen. 2 | Pct. Difference |
|---------------|---------|---------|-----------------|
| Jan. Low Flow | 51.7 | 43.9 | -15 |
| Feb. Low Flow | 65 | 51.4 | -20.9 |
| Mar. Low Flow | 94 | 67.1 | -28.6 |
| Apr. Low Flow | 143 | 131 | -8.71 |
| May Low Flow | 190 | 163 | -14.1 |
| Jun. Low Flow | 221 | 120 | -45.6 |
| Jul. Low Flow | 141 | 84.5 | -40.1 |
| Aug. Low Flow | 93.5 | 75.7 | -19 |
| Sep. Low Flow | 70.2 | 60.9 | -13.4 |
| Oct. Low Flow | 53.6 | 49.9 | -6.77 |
| Nov. Low Flow | 48.5 | 47 | -3.04 |
| Dec. Low Flow | 46 | 39 | -15.2 |

Table 2: Monthly Average Flows

| | Scen. 1 | Scen. 2 | Pct. Difference |
|-------------------|---------|---------|-----------------|
| Overall Mean Flow | 366 | 285 | -22.1 |
| Jan. Mean Flow | 495 | 442 | -10.6 |
| Feb. Mean Flow | 569 | 520 | -8.73 |
| Mar. Mean Flow | 698 | 593 | -15.1 |
| Apr. Mean Flow | 506 | 444 | -12.4 |
| May Mean Flow | 458 | 304 | -33.5 |
| Jun. Mean Flow | 273 | 162 | -40.6 |
| Jul. Mean Flow | 139 | 88.2 | -36.7 |
| Aug. Mean Flow | 120 | 69 | -42.6 |
| Sep. Mean Flow | 192 | 131 | -31.8 |
| Oct. Mean Flow | 163 | 112 | -31.2 |
| Nov. Mean Flow | 339 | 206 | -39.3 |
| Dec. Mean Flow | 451 | 363 | -19.5 |

Table 3: Monthly High Flows

| | Scen. 1 | Scen. 2 | Pct. Difference |
|----------------|---------|---------|-----------------|
| Jan. High Flow | 239 | 156 | -34.5 |
| Feb. High Flow | 799 | 235 | -70.6 |
| Mar. High Flow | 877 | 532 | -39.3 |
| Apr. High Flow | 1600 | 758 | -52.8 |
| May High Flow | 1440 | 759 | -47.4 |
| Jun. High Flow | 2470 | 872 | -64.7 |
| Jul. High Flow | 1680 | 1070 | -35.9 |
| Aug. High Flow | 1010 | 486 | -51.8 |
| Sep. High Flow | 720 | 178 | -75.3 |
| Oct. High Flow | 234 | 104 | -55.6 |
| Nov. High Flow | 142 | 93.9 | -33.9 |
| Dec. High Flow | 128 | 85.3 | -33.4 |

Table 4: Period Low Flows

| | Scen. 1 | Scen. 2 | Pct. Difference |
|--------------------------|---------|---------|-----------------|
| Min. 1 Day Min | 7.58 | 15 | 98 |
| Med. 1 Day Min | 41.6 | 23 | -44.7 |
| Min. 3 Day Min | 9.01 | 15.1 | 67.1 |
| Med. 3 Day Min | 42.4 | 23.7 | -44.2 |
| Min. 7 Day Min | 12.7 | 15.2 | 19.1 |
| Med. 7 Day Min | 43.1 | 25.3 | -41.4 |
| Min. 30 Day Min | 17.3 | 16.4 | -5.17 |
| Med. 30 Day Min | 48.7 | 38.7 | -20.5 |
| Min. 90 Day Min | 30.4 | 23.3 | -23.4 |
| Med. 90 Day Min | 71 | 58.5 | -17.7 |
| 7Q10 | 27.9 | 17.6 | -37 |
| Year of 90-Day Min. Flow | 2010 | 2000 | -0.3 |
| Drought Year Mean | 201 | 34.8 | -82.7 |
| Mean Baseflow | 150 | 126 | -16 |

Table 5: Period High Flows

| | Scen. 1 | Scen. 2 | Pct. Difference |
|-----------------|---------|---------|-----------------|
| Max. 1 Day Max | 10900 | 9640 | -11.6 |
| Med. 1 Day Max | 4670 | 3130 | -33 |
| Max. 3 Day Max | 9350 | 7470 | -20.2 |
| Med. 3 Day Max | 3920 | 2570 | -34.3 |
| Max. 7 Day Max | 5690 | 5050 | -11.1 |
| Med. 7 Day Max | 2540 | 2000 | -21.2 |
| Max. 30 Day Max | 3130 | 3030 | -3.17 |
| Med. 30 Day Max | 1170 | 974 | -16.5 |
| Max. 90 Day Max | 2060 | 1980 | -4.25 |
| Med. 90 Day Max | 732 | 530 | -27.6 |

Table 6: Non-Exceedance Flows

| | Scen. 1 | Scen. 2 | Pct. Difference |
|--------------------------|---------|---------|-----------------|
| 1% Non-Exceedance | 32.3 | 18.7 | -42.2 |
| 5% Non-Exceedance | 40.3 | 28.2 | -30 |
| 50% Non-Exceedance | 145 | 98.2 | -32.3 |
| 95% Non-Exceedance | 1360 | 1110 | -18.3 |
| 99% Non-Exceedance | 3380 | 2800 | -17.2 |
| Sept. 10% Non-Exceedance | 39 | 24.1 | -38.3 |

Additional Tables: Land-River Segment Flow Metrics

tab.cbp6_N51033_YP3_6700_6670.means.by.flow

| | Mean Unit Flow (cfs/sq. mi) |
|----------------------------|-----------------------------|
| SURface Outflow | 0.00145 |
| InterFloW Outflow | 0.000253 |
| Active GroundWater Outflow | 0.000553 |

tab.cbp6_N51033_YP3_6700_6670.zero.day.ratios.by.flow

| | Ratio of Days with Zero Flow to Total Days |
|----------------------------|--|
| SURface Outflow | 0.691 |
| InterFloW Outflow | 0.488 |
| Active GroundWater Outflow | 0.333 |

tab.cbp6_N51033_YP3_6700_6670.means.by.land.use

| | Mean Unit Flow (cfs/sq. mi) |
|-----|-----------------------------|
| aop | 0.000473 |
| cch | 0.000683 |
| cci | 0.00121 |
| ccn | 0.000701 |
| cfr | 0.00041 |
| cir | 0.00121 |
| cmo | 0.000425 |
| cnr | 0.00121 |
| ctg | 0.000683 |
| dbl | 0.000499 |
| fnp | 0.00121 |
| for | 0.00041 |
| fsp | 0.00121 |
| gom | 0.000499 |
| gwm | 0.000499 |
| hfr | 0.000542 |
| lhy | 0.000472 |
| mch | 0.000683 |
| mci | 0.00121 |
| mcn | 0.000701 |
| mir | 0.00121 |
| mnr | 0.00121 |
| mtg | 0.000683 |
| nch | 0.000683 |
| nci | 0.00121 |
| nir | 0.00121 |
| nnr | 0.00121 |
| ntg | 0.000683 |
| oac | 0.000499 |
| ohy | 0.000472 |
| osp | 0.000425 |
| pas | 0.000472 |
| sch | 0.000499 |
| scl | 0.000499 |
| sgg | 0.000499 |
| sho | 0.00121 |
| som | 0.000499 |
| soy | 0.000499 |
| stb | 0.00121 |
| stf | 0.00121 |
| swm | 0.000499 |
| wfp | 0.00041 |
| wto | 0.000161 |

tab.cbp6_N51033_YP3_6700_6670.zero.day.ratios.by.land.use

| | Ratio of Days with Zero Flow to Total Days |
|-----|--|
| aop | 0.307 |
| cch | 0.297 |
| cci | 0.907 |
| ccn | 0.29 |
| cfr | 0.337 |
| cir | 0.907 |
| cmo | 0.322 |
| cnr | 0.907 |
| ctg | 0.297 |
| dbl | 0.298 |
| fnp | 0.906 |
| for | 0.339 |
| fsp | 0.906 |
| gom | 0.298 |
| gwm | 0.298 |
| hfr | 0.293 |
| lhy | 0.308 |
| mch | 0.297 |
| mci | 0.907 |
| mcn | 0.29 |
| mir | 0.907 |
| mnr | 0.907 |
| mtg | 0.297 |
| nch | 0.297 |
| nci | 0.907 |
| nir | 0.907 |
| nnr | 0.907 |
| ntg | 0.297 |
| oac | 0.298 |
| ohy | 0.308 |
| osp | 0.322 |
| pas | 0.308 |
| sch | 0.298 |
| scl | 0.298 |
| sgg | 0.298 |
| sho | 0.907 |
| som | 0.298 |
| soy | 0.298 |
| stb | 0.907 |
| stf | 0.907 |
| swm | 0.298 |
| wfp | 0.339 |
| wto | 0.508 |

tab.cbp6_N51085_YP3_6700_6670.means.by.flow

| | Mean Unit Flow (cfs/sq. mi) |
|----------------------------|-----------------------------|
| SURface Outflow | 0.00137 |
| InterFloW Outflow | 0.000196 |
| Active GroundWater Outflow | 0.000654 |

tab.cbp6_N51085_YP3_6700_6670.zero.day.ratios.by.flow

| | Ratio of Days with Zero Flow to Total Days |
|----------------------------|--|
| SURface Outflow | 0.69 |
| InterFloW Outflow | 0.477 |
| Active GroundWater Outflow | 0.333 |

tab.cbp6_N51085_YP3_6700_6670.means.by.land.use

| | Mean Unit Flow (cfs/sq. mi) |
|-----|-----------------------------|
| aop | 4.49e-04 |
| cch | 6.61e-04 |
| cci | 1.23e-03 |
| ccn | 6.71e-04 |
| cfr | 3.80e-04 |
| cir | 1.23e-03 |
| cmo | 3.95e-04 |
| cnr | 1.23e-03 |
| ctg | 6.61e-04 |
| dbl | 4.76e-04 |
| fnp | 1.23e-03 |
| for | 3.80e-04 |
| fsp | 1.23e-03 |
| gom | 4.76e-04 |
| gwm | 4.76e-04 |
| hfr | 5.27e-04 |
| lhy | 4.49e-04 |
| mch | 6.61e-04 |
| mci | 1.23e-03 |
| mcn | 6.71e-04 |
| mir | 1.23e-03 |
| mnr | 1.23e-03 |
| mtg | 6.61e-04 |
| nch | 6.61e-04 |
| nci | 1.23e-03 |
| nir | 1.23e-03 |
| nnr | 1.23e-03 |
| ntg | 6.61e-04 |
| oac | 4.76e-04 |
| ohy | 4.49e-04 |
| osp | 3.95e-04 |
| pas | 4.49e-04 |
| sch | 4.76e-04 |
| scl | 4.76e-04 |
| sgg | 4.76e-04 |
| sho | 1.23e-03 |
| som | 4.76e-04 |
| soy | 4.76e-04 |
| stb | 1.23e-03 |
| stf | 1.23e-03 |
| swm | 4.76e-04 |
| wfp | 3.80e-04 |
| wto | 8.51e-05 |

tab.cbp6_N51085_YP3_6700_6670.zero.day.ratios.by.land.use

| | Ratio of Days with Zero Flow to Total Days |
|-----|--|
| aop | 0.302 |
| cch | 0.289 |
| cci | 0.908 |
| ccn | 0.279 |
| cfr | 0.33 |
| cir | 0.908 |
| cmo | 0.318 |
| cnr | 0.908 |
| ctg | 0.289 |
| dbl | 0.293 |
| fnp | 0.905 |
| for | 0.331 |
| fsp | 0.905 |
| gom | 0.293 |
| gwm | 0.293 |
| hfr | 0.287 |
| lhy | 0.304 |
| mch | 0.289 |
| mci | 0.908 |
| mcn | 0.279 |
| mir | 0.908 |
| mnr | 0.908 |
| mtg | 0.289 |
| nch | 0.289 |
| nci | 0.908 |
| nir | 0.908 |
| nnr | 0.908 |
| ntg | 0.289 |
| oac | 0.293 |
| ohy | 0.304 |
| osp | 0.318 |
| pas | 0.304 |
| sch | 0.293 |
| scl | 0.293 |
| sgg | 0.293 |
| sho | 0.908 |
| som | 0.293 |
| soy | 0.293 |
| stb | 0.908 |
| stf | 0.908 |
| swm | 0.293 |
| wfp | 0.331 |
| wto | 0.496 |

Fig. 1: Hydrograph

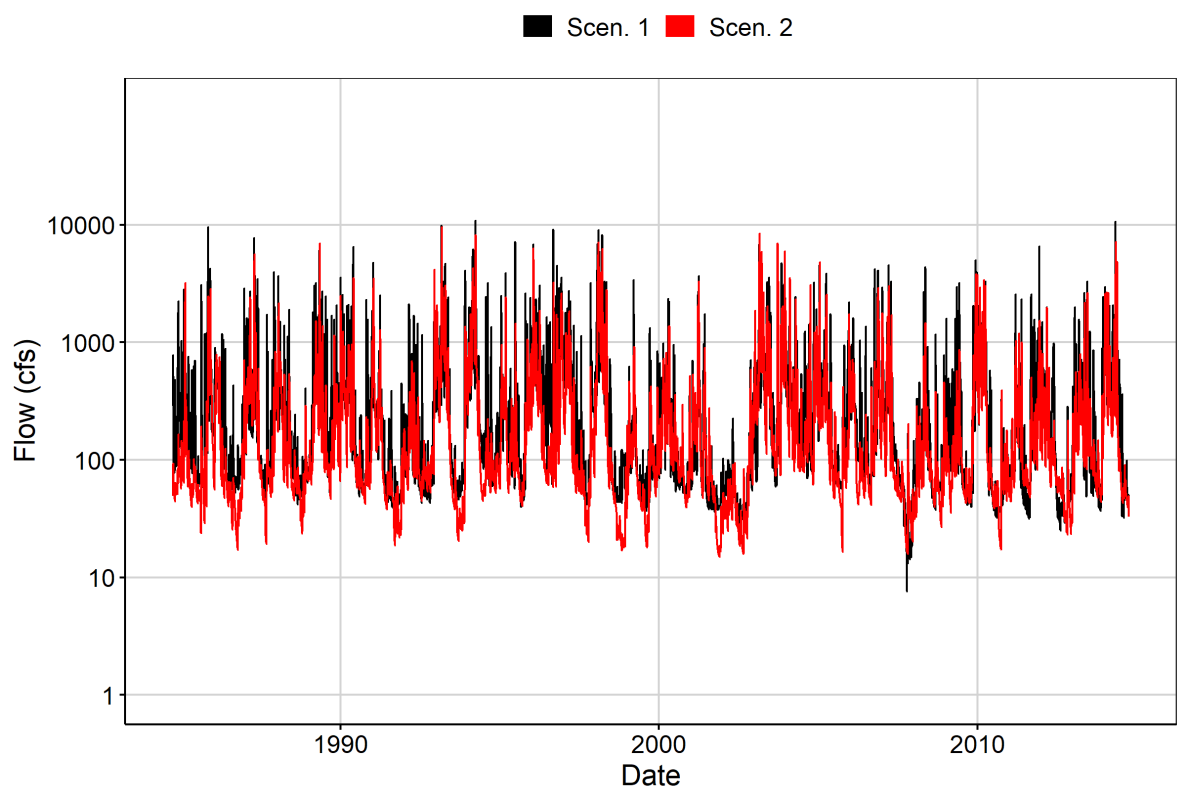


Fig. 2: Zoomed Hydrograph

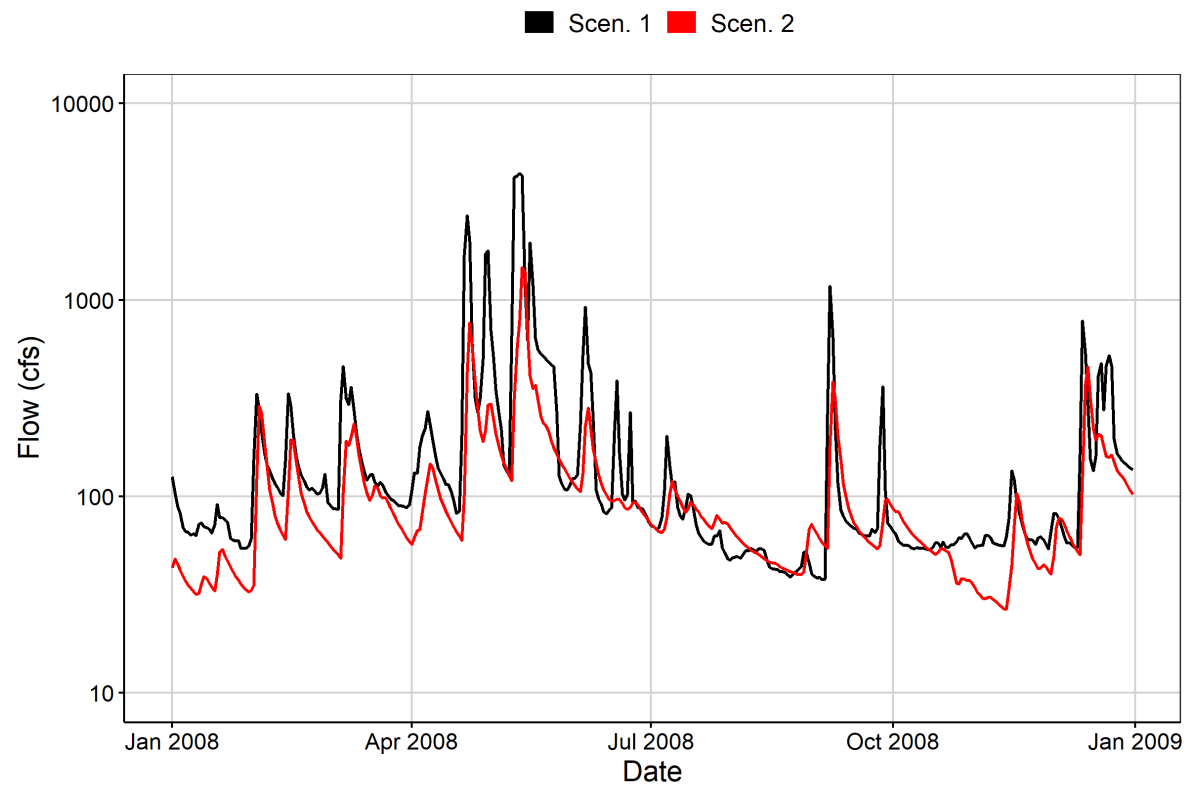


Fig. 3: Flow Exceedance

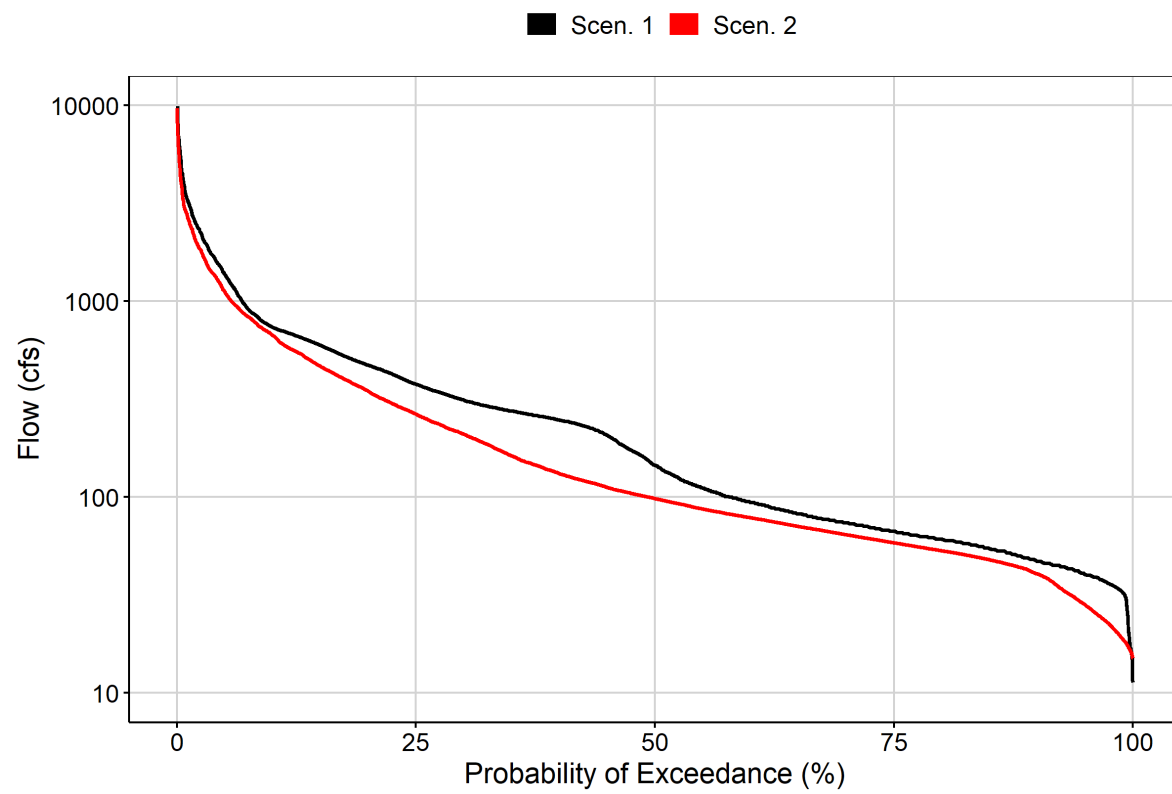


Fig. 4: Baseflow

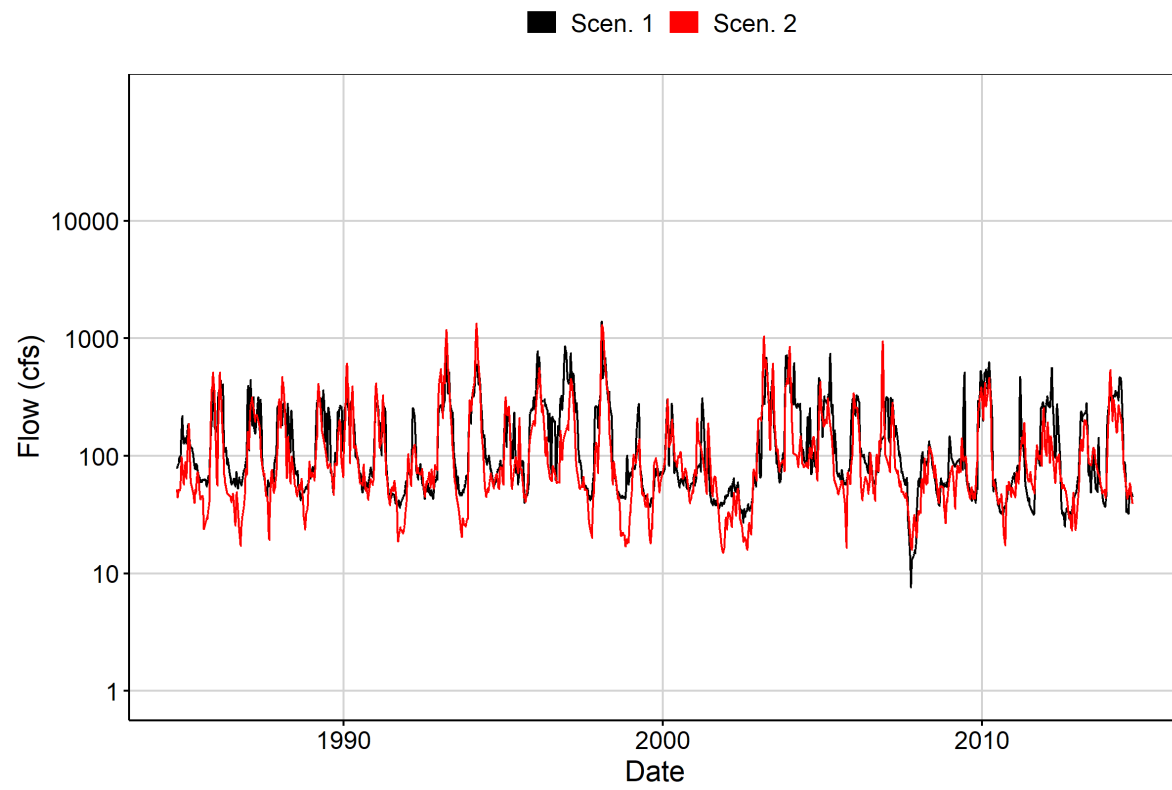


Fig. 5: Combined Baseflow

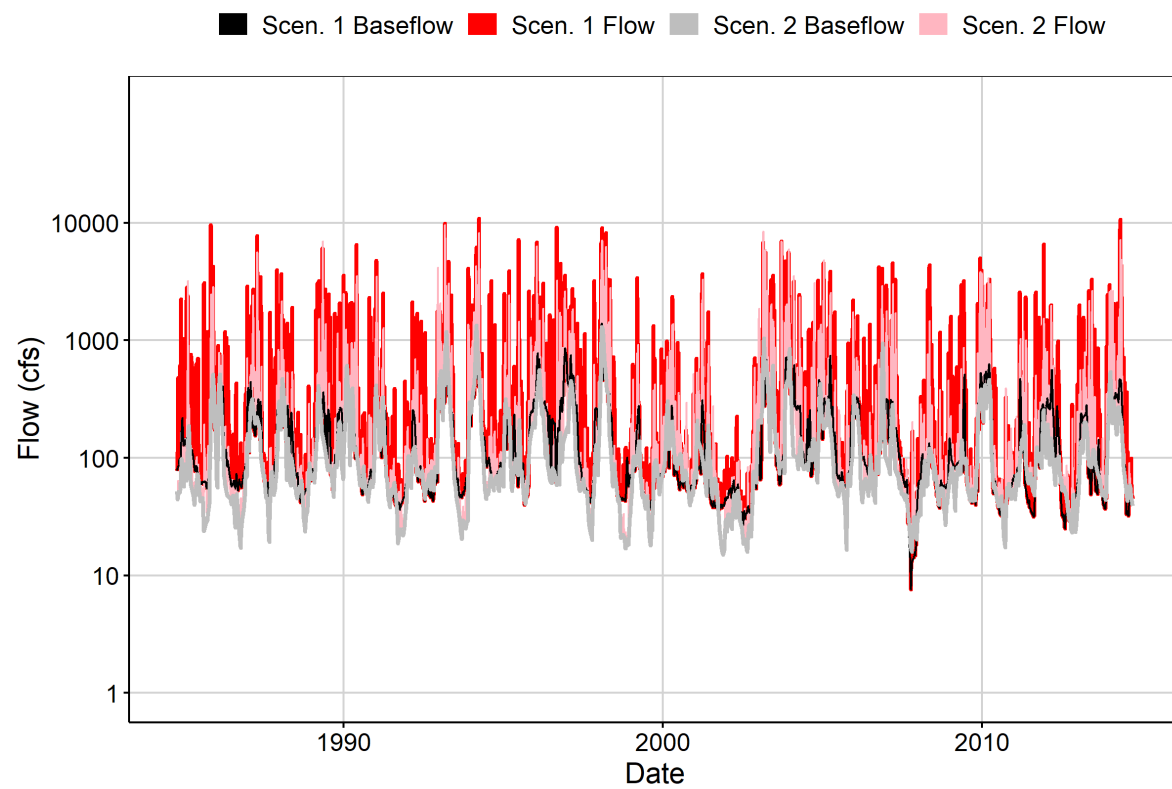


Fig. 6: Largest Difference Period

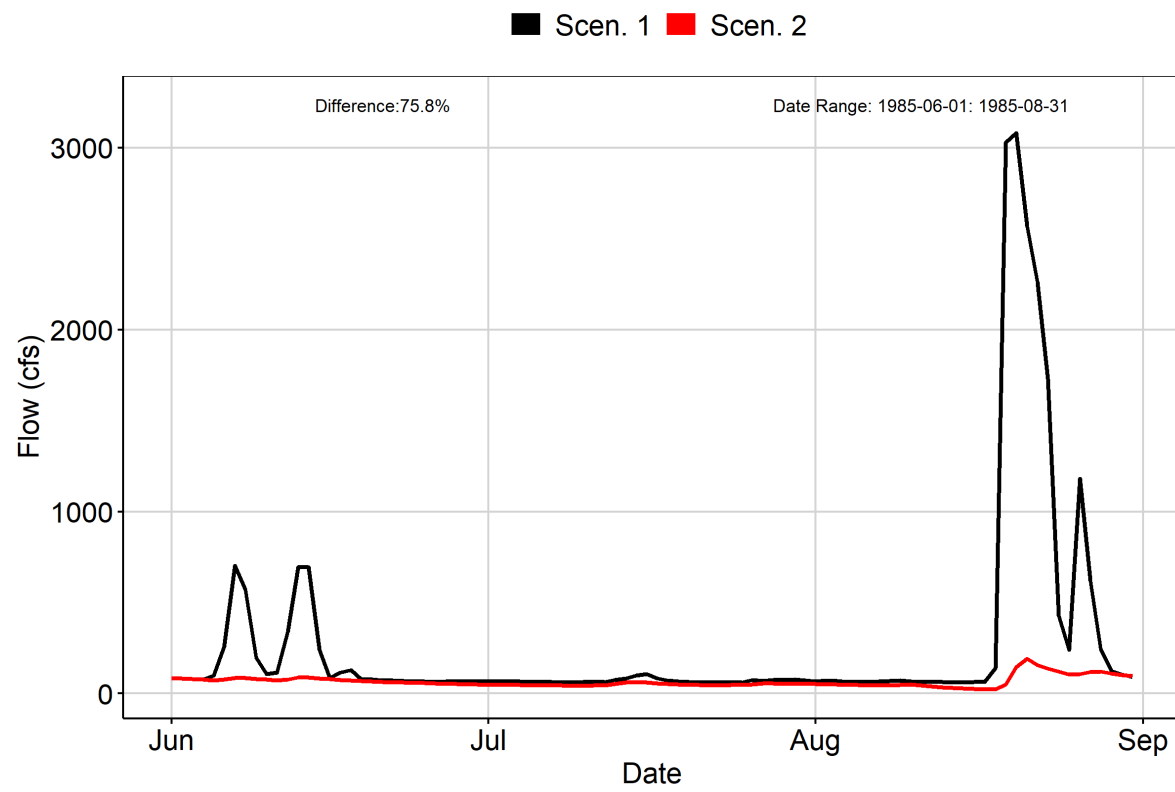


Fig. 7: Second Largest Difference Period

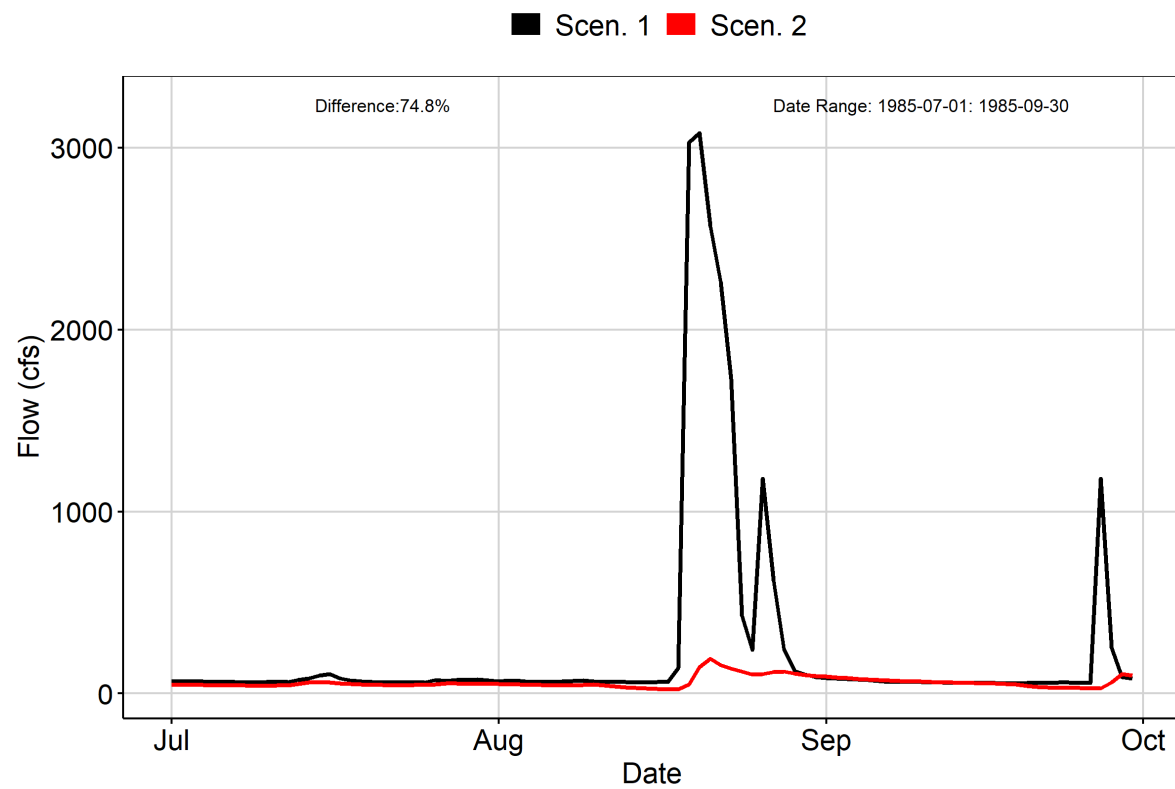


Fig. 8: Third Largest Difference Period

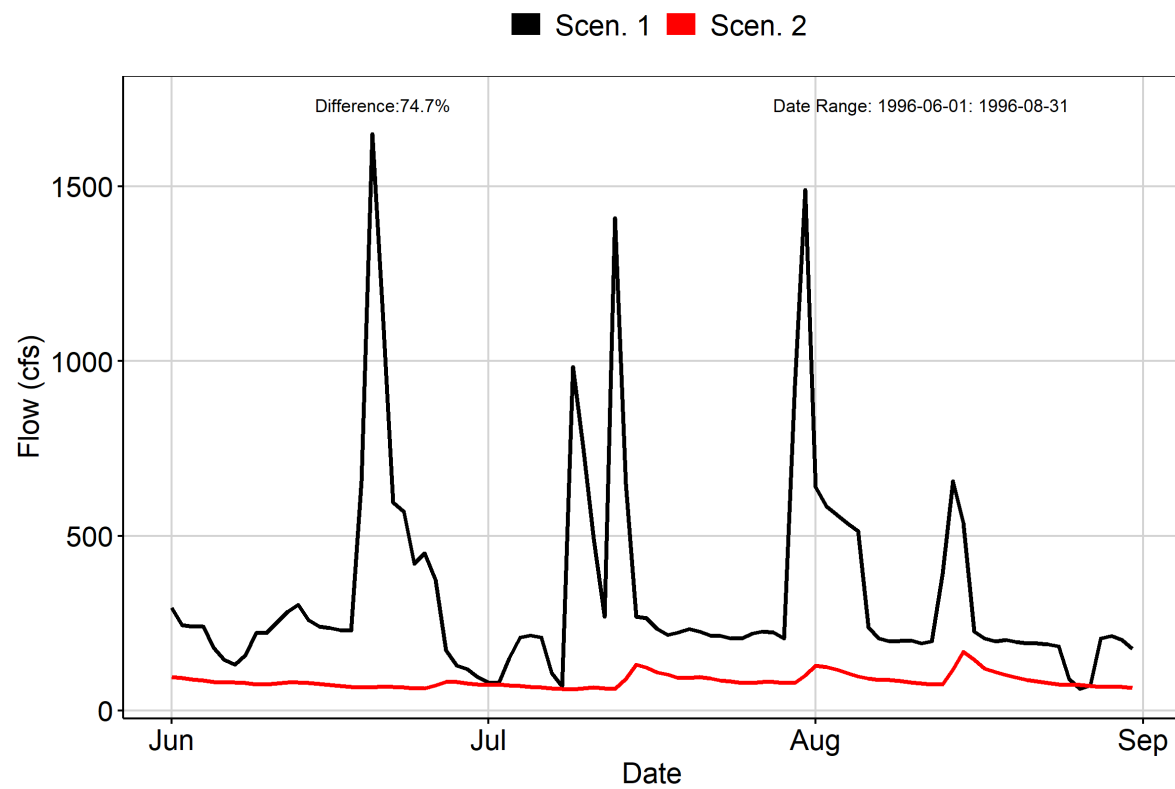


Fig. 9A: Residuals Plot

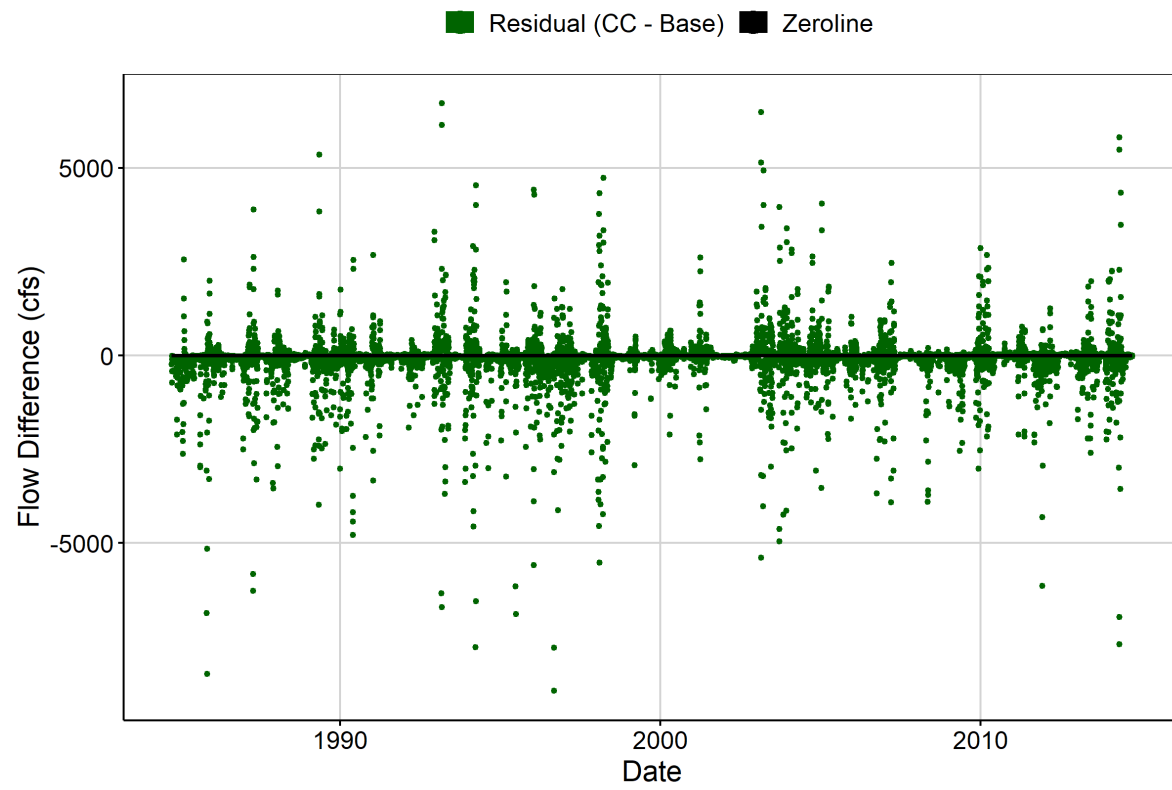


Fig. 9B: Area Weighted Residuals Plot

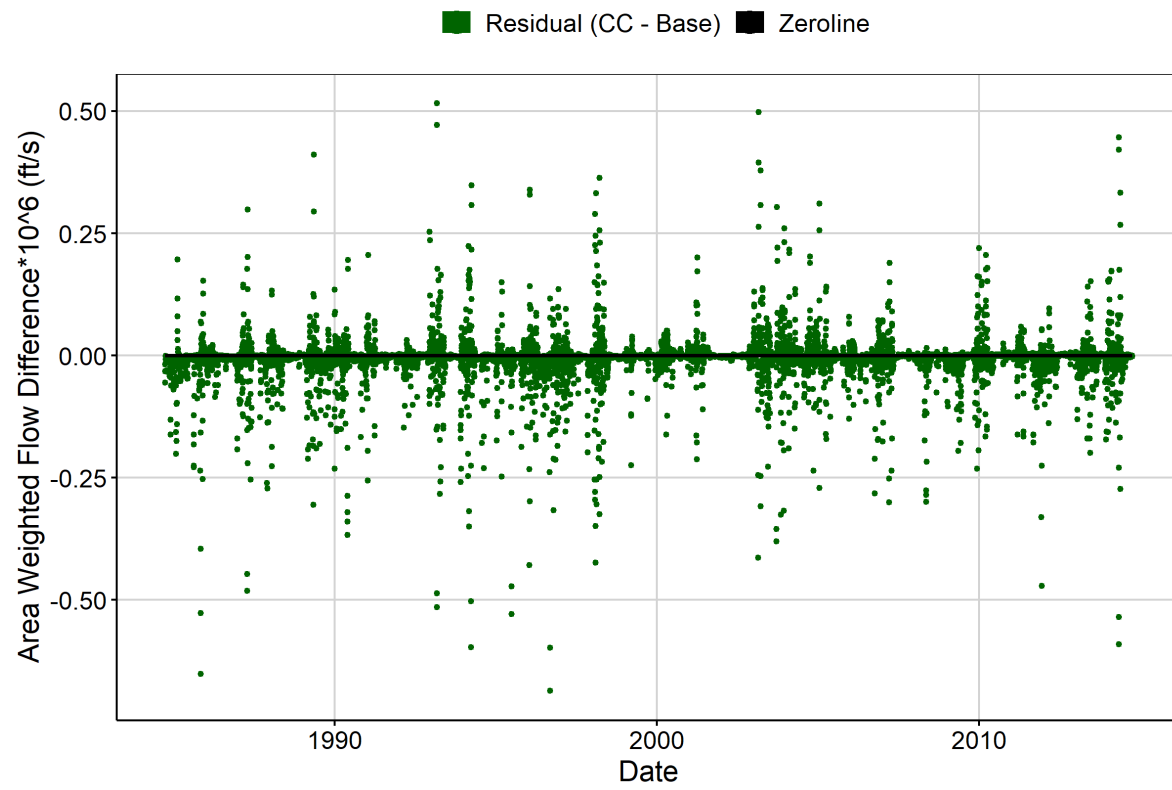


Fig. 10: VA Hydro Scen. 1 Runit Values (Outliers Excluded)

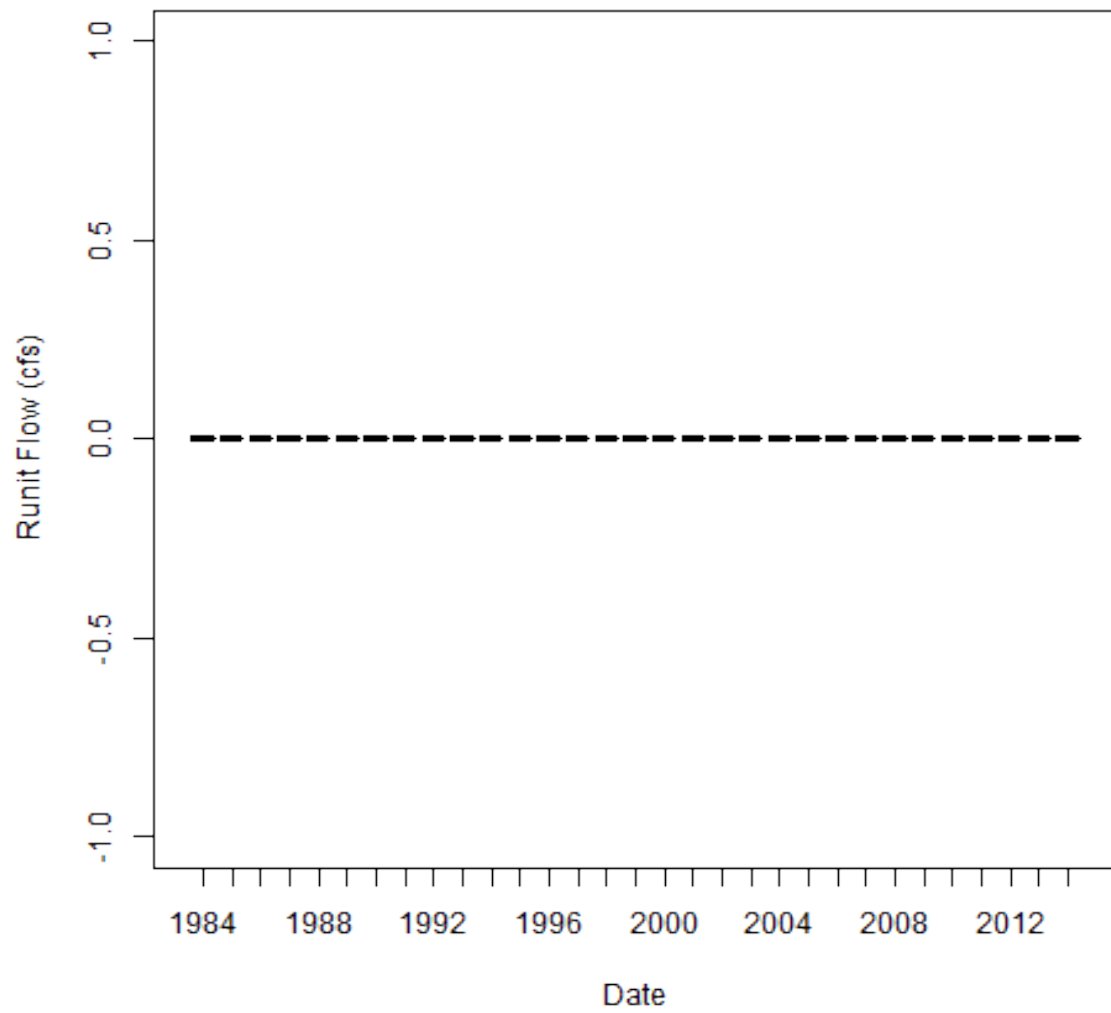


Fig. 11: Smallest Difference Period

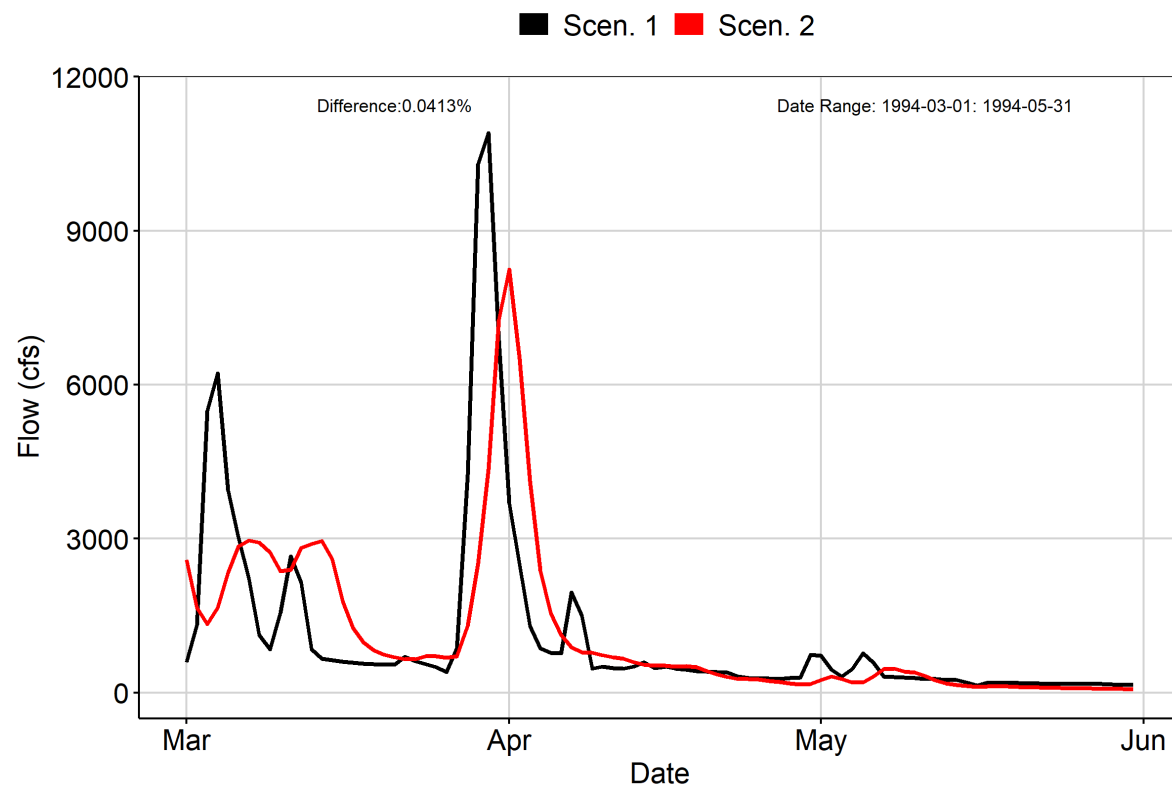


Fig. 12: Second Smallest Difference Period

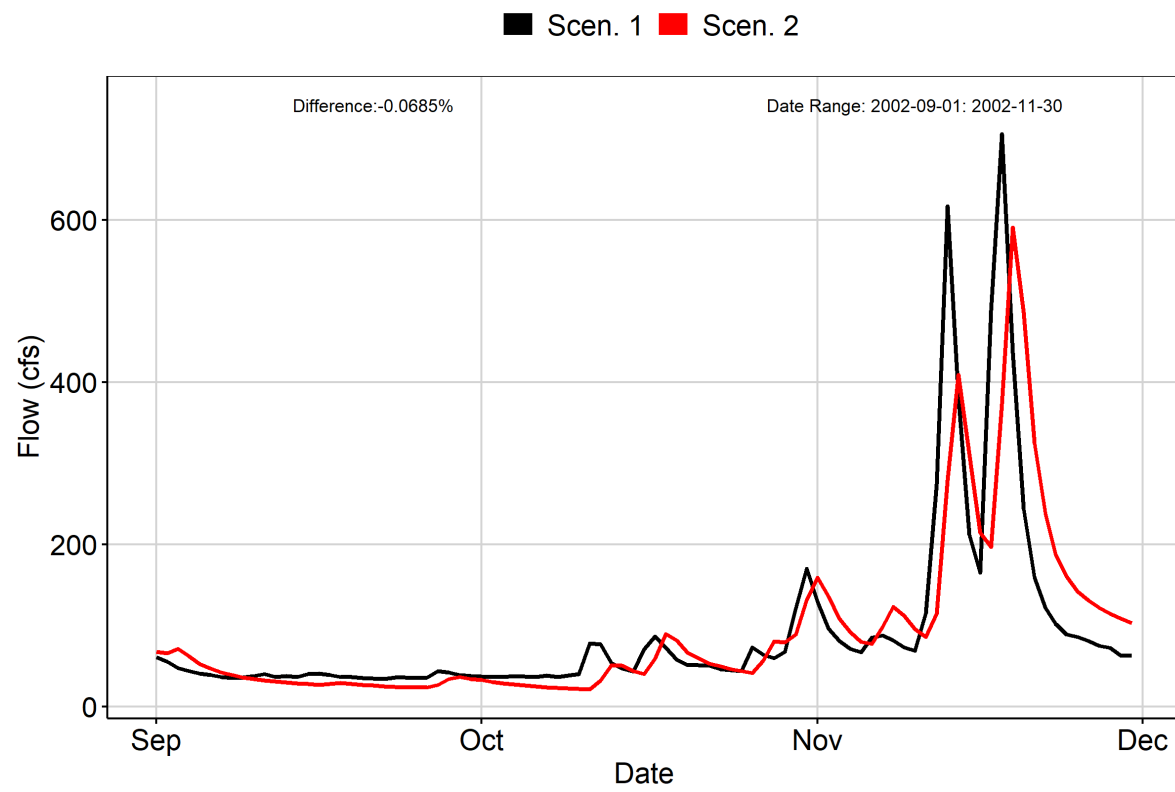


Fig. 13: Third Smallest Difference Period

