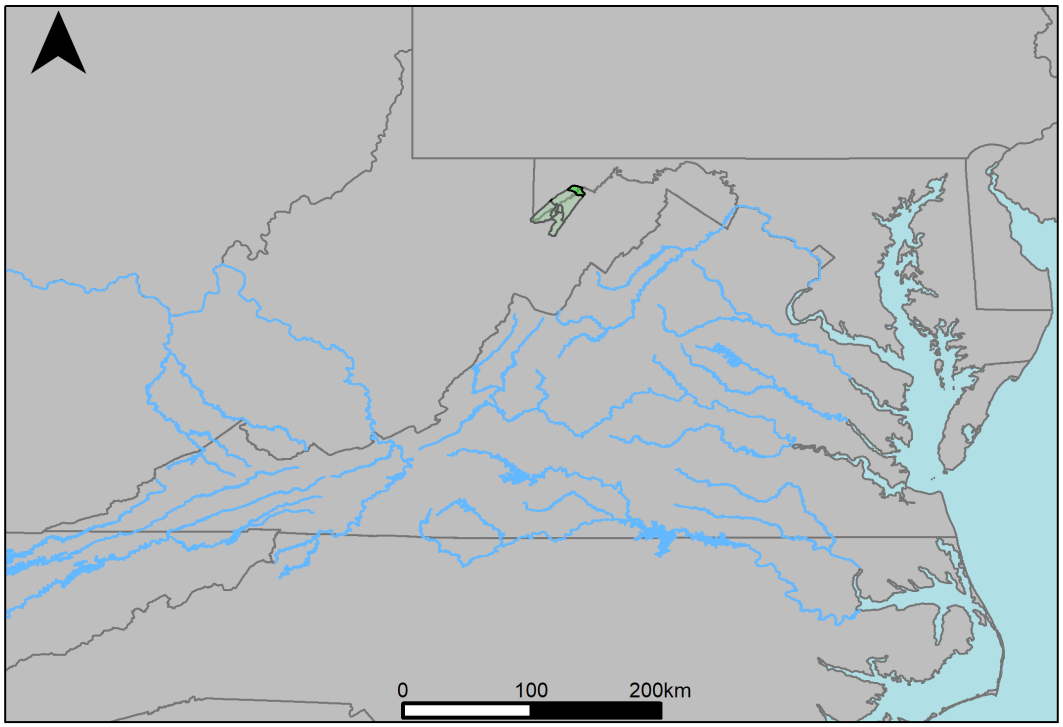
River Segment JU1_7690_7490: VA Hydro Run 120 vs. VA Hydro Run 121



This river segment follows part of the flow of Craig Creek at Parr, VA. Gage 02018000 is located in Botetourt County, VA (Lat 37 39'57", long 79 54'42") approximately 0.2 miles northeast of Horton. Drainage area is 329 sq. miles. This gage started taking data in 1925 and is still taking data currently. There are no known anthropogenic alterations in this area that would affect the flow conditions. The average daily discharge change between scenario 1 and scenario 2 for the 20 year timespan was 4.14883%, with 0.556% of its rolling three month time spans above 20% difference.

Table 1: Monthly Low Flows

	Scen. 1	Scen. 2	Pct. Difference
Jan. Low Flow	17.5	17.8	1.41
Feb. Low Flow	37.5	39.6	5.53
Mar. Low Flow	70.2	71.4	1.82
Apr. Low Flow	89.4	98.1	9.7
May Low Flow	121	128	5.6
Jun. Low Flow	120	120	-0.1
Jul. Low Flow	83.3	86	3.26
Aug. Low Flow	60.3	59.8	-0.9
Sep. Low Flow	15.6	15.8	1.63
Oct. Low Flow	3.3	3.4	3.02
Nov. Low Flow	2.72	2.82	3.41
Dec. Low Flow	5.23	5.19	-0.87

Table 2: Monthly Average Flows

	Scen. 1	Scen. 2	Pct. Difference
Overall Mean Flow	133	138	4.15
Jan. Mean Flow	202	216	6.96
Feb. Mean Flow	214	225	5.37
Mar. Mean Flow	258	254	-1.26
Apr. Mean Flow	204	216	5.87
May Mean Flow	134	139	3.55
Jun. Mean Flow	101	105	4.18
Jul. Mean Flow	42.5	43.2	1.75
Aug. Mean Flow	49.3	52.2	5.84
Sep. Mean Flow	80.7	86.7	7.4
Oct. Mean Flow	71.3	72.4	1.57
Nov. Mean Flow	104	108	3.86
Dec. Mean Flow	141	150	6.27

Table 3: Monthly High Flows

	Scen. 1	Scen. 2	Pct. Difference
Jan. High Flow	59.9	62.2	3.88
Feb. High Flow	185	193	4.37
Mar. High Flow	228	270	18.4
Apr. High Flow	600	647	7.82
May High Flow	420	450	7.2
Jun. High Flow	524	535	2.25
Jul. High Flow	375	372	-0.62
Aug. High Flow	233	248	6.47
Sep. High Flow	96.7	97	0.3
Oct. High Flow	71.1	81.3	14.3
Nov. High Flow	64.9	71.5	10.1
Dec. High Flow	74.9	79.5	6.17

Table 4: Period Low Flows

	Scen. 1	Scen. 2	Pct. Difference
Min. 1 Day Min	0.01	0.01	7.68
Med. 1 Day Min	1.36	1.32	-2.86
Min. 3 Day Min	0.01	0.01	7.94
Med. 3 Day Min	1.55	1.5	-2.8
Min. 7 Day Min	0.01	0.01	8.6
Med. 7 Day Min	2.02	1.97	-2.64
Min. 30 Day Min	0.09	0.09	3.49
Med. 30 Day Min	6.75	7.09	5.09
Min. 90 Day Min	9.12	9.47	3.85
Med. 90 Day Min	25.9	26.5	2.33
7Q10	0.08	0.09	7.66
Year of 90-Day Min. Flow	2000	2000	0
Drought Year Mean	72.9	78	6.96
Mean Baseflow	72.4	73.4	1.44

Table 5: Period High Flows

	Scen. 1	Scen. 2	Pct. Difference
Max. 1 Day Max	3320	3350	0.71
Med. 1 Day Max	1510	1700	12.4
Max. 3 Day Max	2310	2320	0.42
Med. 3 Day Max	1100	1220	11.2
Max. 7 Day Max	1240	1240	0.09
Med. 7 Day Max	690	769	11.5
Max. 30 Day Max	715	716	0.21
Med. 30 Day Max	345	356	3.08
Max. 90 Day Max	479	514	7.23
Med. 90 Day Max	245	248	1.42

Table 6: Non-Exceedance Flows

	Scen. 1	Scen. 2	Pct. Difference
1% Non-Exceedance	0.32	0.33	2.07
5% Non-Exceedance	3.45	3.47	0.66
50% Non-Exceedance	85.8	87.9	2.47
95% Non-Exceedance	403	421	4.42
99% Non-Exceedance	954	1070	12
Sept. 10% Non-Exceedance	1.28	1.32	3.14

Additional Tables: Land-River Segment Flow Metrics

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	Mean Unit Flow (cfs/sq. mi)
SURface Outflow	0.00134
InterFloW Outflow	0.000396
Active GroundWater Outflow	0.000813

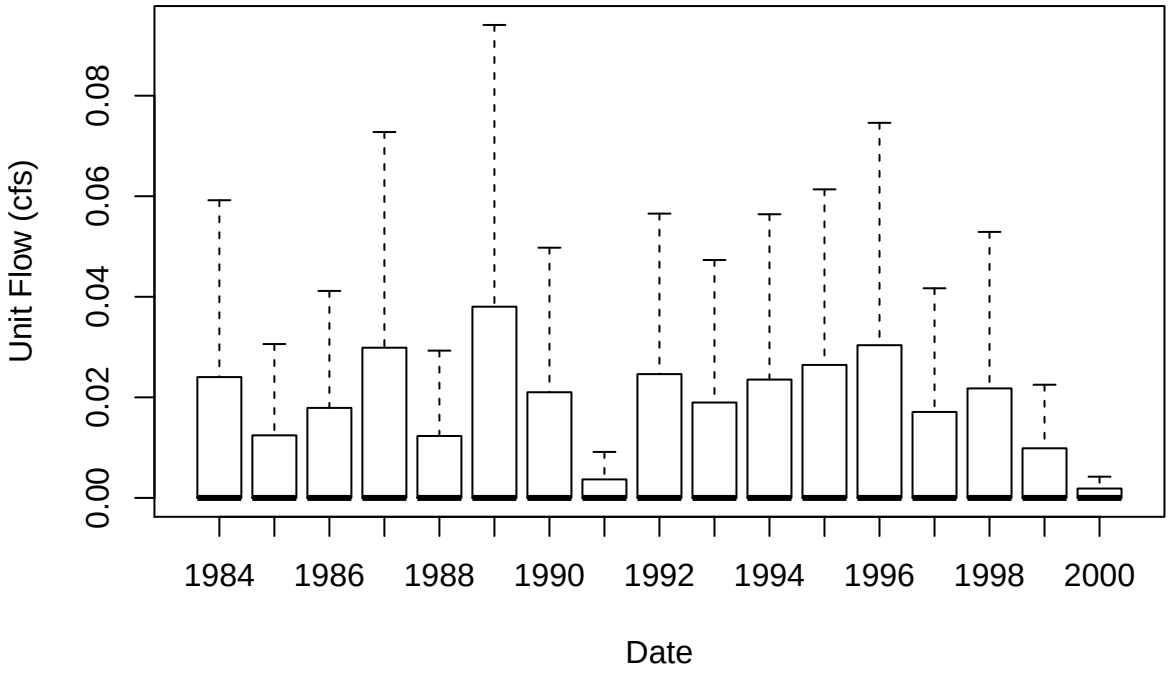
tab.cbp6_N51045_JU1_7690_7490.zero.day.ratios.by.flow

	Ratio of Days with Zero Flow to Total Days
SURface Outflow	0.637
InterFloW Outflow	0.465
Active GroundWater Outflow	0.342

tab.SURO.cbp6_N51045_JU1_7690_7490.iqr.by.lrseg.flow.annual

	IQR of Unit Flows (cfs/sq. mi) [25th, 75th]
1984	4.31e-06 [0, 4.31e-06]
1985	2.33e-06 [0, 2.33e-06]
1986	5.19e-06 [0, 5.19e-06]
1987	1.42e-05 [0, 1.42e-05]
1988	1.76e-06 [0, 1.76e-06]
1989	2.08e-05 [0, 2.08e-05]
1990	7.11e-06 [0, 7.11e-06]
1991	1.98e-07 [0, 1.98e-07]
1992	1.13e-05 [0, 1.13e-05]
1993	5.97e-06 [0, 5.97e-06]
1994	9.56e-06 [0, 9.56e-06]
1995	8.35e-06 [0, 8.35e-06]
1996	3.7e-05 [0, 3.7e-05]
1997	5.75e-06 [0, 5.75e-06]
1998	6.15e-06 [0, 6.15e-06]
1999	1.88e-06 [0, 1.88e-06]
2000	2.88e-07 [0, 2.88e-07]

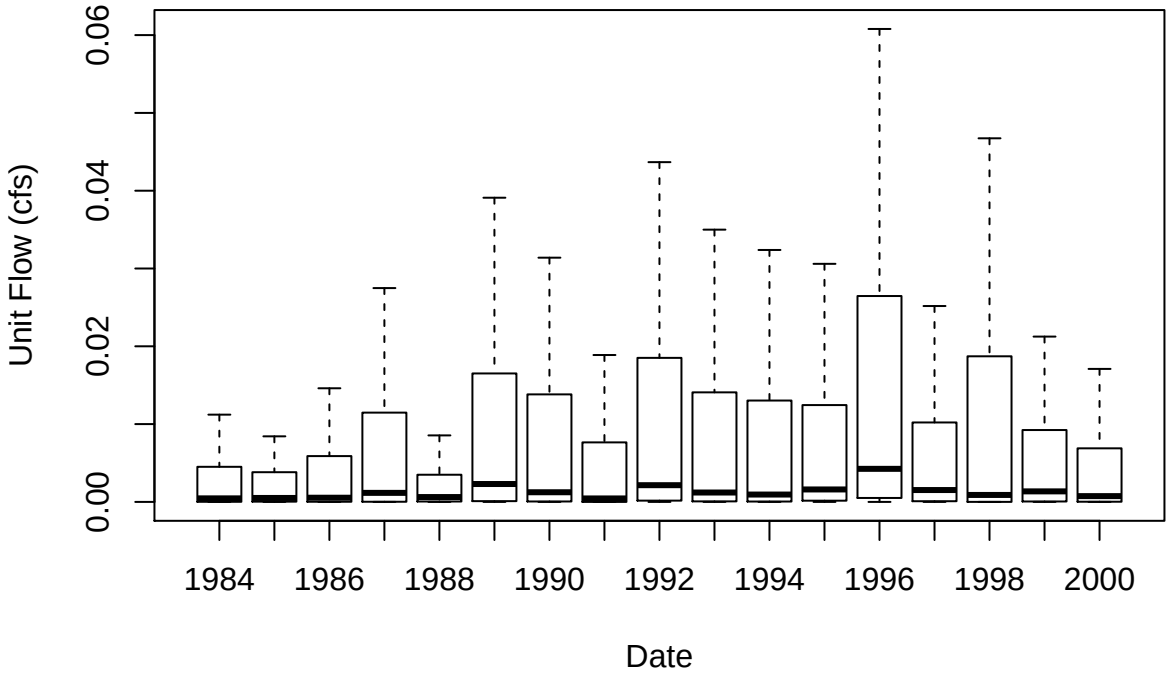
Fig: Boxplot of Annual SURO Flows for LR-seg cbp6_N51045_JU1_7690_7490



tab.IFWO.cbp6_N51045_JU1_7690_7490.iqr.by.lrseg.flow.annual

	IQR of Unit Flows (cfs/sq. mi) [25th, 75th]
1984	3.78e-05 [0, 3.78e-05]
1985	3.73e-05 [0, 3.73e-05]
1986	3.95e-05 [0, 3.95e-05]
1987	9.69e-05 [0, 9.69e-05]
1988	3.29e-05 [0, 3.29e-05]
1989	0.000183 [0, 0.000183]
1990	0.000149 [0, 0.000149]
1991	4.93e-05 [0, 4.93e-05]
1992	0.000171 [0, 0.000171]
1993	0.000126 [0, 0.000126]
1994	0.000105 [0, 0.000105]
1995	0.00013 [0, 0.00013]
1996	0.000348 [0, 0.000348]
1997	0.000107 [0, 0.000107]
1998	0.000122 [0, 0.000122]
1999	9.15e-05 [0, 9.15e-05]
2000	6.91e-05 [0, 6.91e-05]

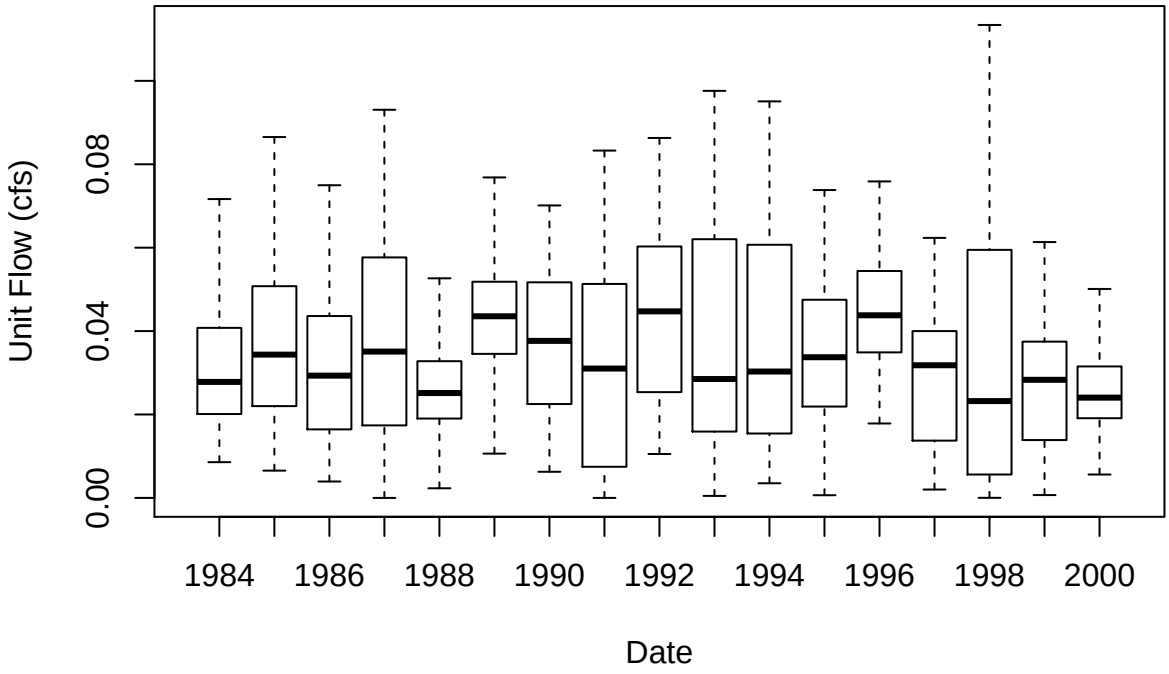
Fig: Boxplot of Annual IFWO Flows for LR-seg cbp6_N51045_JU1_7690_7490



tab.AGWO.cbp6_N51045_JU1_7690_7490.iqr.by.lrseg.flow.annual

	IQR of Unit Flows (cfs/sq. mi) [25th, 75th]
1984	0.0012 [0, 0.0012]
1985	0.00141 [0, 0.00141]
1986	0.0012 [0, 0.0012]
1987	0.00148 [0, 0.00148]
1988	0.000993 [0, 0.000993]
1989	0.00164 [0, 0.00164]
1990	0.00152 [0, 0.00152]
1991	0.0014 [0, 0.0014]
1992	0.00175 [0, 0.00175]
1993	0.00161 [0, 0.00161]
1994	0.00146 [0, 0.00146]
1995	0.00135 [0, 0.00135]
1996	0.0017 [0, 0.0017]
1997	0.00124 [0, 0.00124]
1998	0.00142 [0, 0.00142]
1999	0.00116 [0, 0.00116]
2000	0.000958 [0, 0.000958]

Fig: Boxplot of Annual AGWO Flows for LR-seg cbp6_N51045_JU1_7690_7490



tab.cbp6__N51045__JU1__7690__7490.means.by.land.use

	Mean Unit Flow (cfs/sq. mi)
aop	0.000668
cch	0.000787
cci	0.00114
ccn	0.000827
cfr	0.000639
cir	0.00114
cmo	0.000654
cnr	0.00114
ctg	0.000787
dbl	0.000692
fnp	0.00114
for	0.00064
fsp	0.00114
gom	0.000692
gwm	0.000692
hfr	0.000694
lhy	0.000668
mch	0.000787
mci	0.00114
mcn	0.000827
mir	0.00114
mnr	0.00114
mtg	0.000787
nch	0.000787
nci	0.00114
nir	0.00114
nnr	0.00114
ntg	0.000787
oac	0.000692
ohy	0.000668
osp	0.000654
pas	0.000668
sch	0.000692
scl	0.000692
sgg	0.000692
sho	0.00114
som	0.000692
soy	0.000692
stb	0.00114
stf	0.00114
swm	0.000692
wfp	0.00064
wto	0.00064

tab.cbp6_N51045_JU1_7690_7490.zero.day.ratios.by.land.use

	Ratio of Days with Zero Flow to Total Days
aop	0.281
cch	0.277
cci	0.891
ccn	0.255
cfr	0.32
cir	0.891
cmo	0.295
cnr	0.891
ctg	0.277
dbl	0.276
fnp	0.891
for	0.33
fsp	0.891
gom	0.276
gwm	0.276
hfr	0.279
lhy	0.28
mch	0.277
mci	0.891
mcn	0.255
mir	0.891
mnr	0.891
mtg	0.277
nch	0.277
nci	0.891
nir	0.891
nnr	0.891
ntg	0.277
oac	0.276
ohy	0.28
osp	0.295
pas	0.28
sch	0.276
scl	0.276
sgg	0.276
sho	0.891
som	0.276
soy	0.276
stb	0.891
stf	0.891
swm	0.276
wfp	0.33
wto	0.33

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	Mean Unit Flow (cfs/sq. mi)
SURface Outflow	0.0013
InterFloW Outflow	0.00035
Active GroundWater Outflow	0.000463

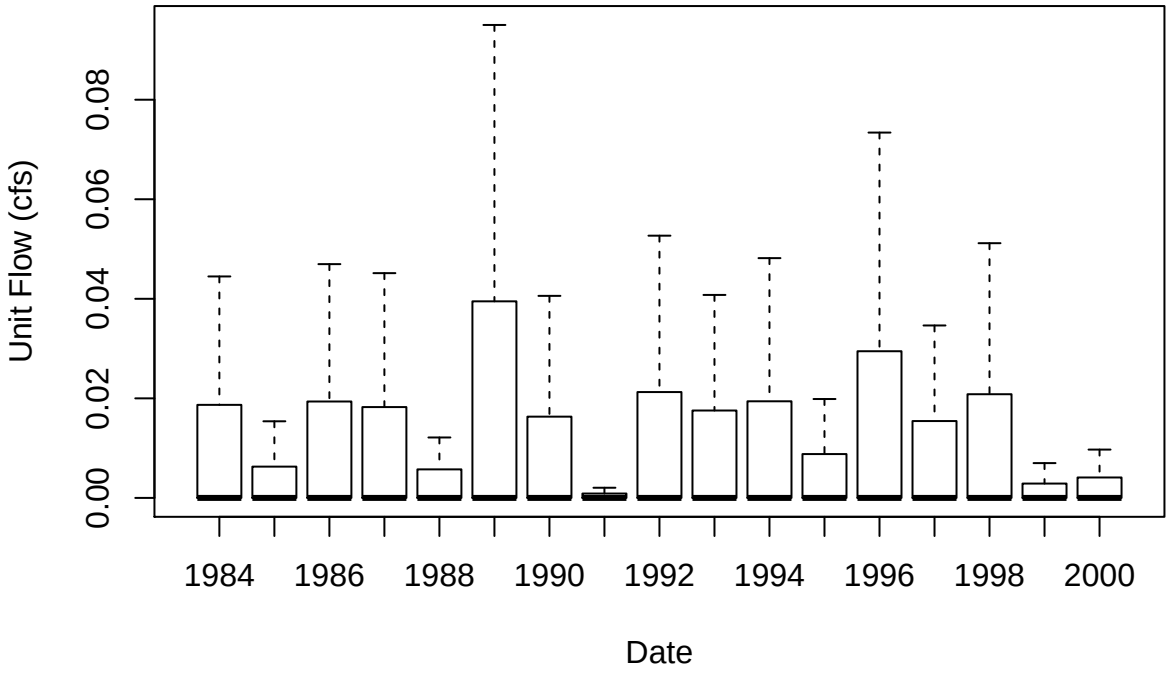
tab.cbp6_N51121_JU1_7690_7490.zero.day.ratios.by.flow

	Ratio of Days with Zero Flow to Total Days
SURface Outflow	0.673
InterFloW Outflow	0.519
Active GroundWater Outflow	0.36

tab.SURO.cbp6_N51121_JU1_7690_7490.iqr.by.lrseg.flow.annual

	IQR of Unit Flows (cfs/sq. mi) [25th, 75th]
1984	2.77e-06 [0, 2.77e-06]
1985	1.76e-06 [0, 1.76e-06]
1986	5.83e-06 [0, 5.83e-06]
1987	1.03e-05 [0, 1.03e-05]
1988	8.85e-07 [0, 8.85e-07]
1989	1.96e-05 [0, 1.96e-05]
1990	4.78e-06 [0, 4.78e-06]
1991	7.74e-09 [0, 7.74e-09]
1992	1.22e-05 [0, 1.22e-05]
1993	7.66e-06 [0, 7.66e-06]
1994	6.62e-06 [0, 6.62e-06]
1995	5.79e-06 [0, 5.79e-06]
1996	3.7e-05 [0, 3.7e-05]
1997	4.91e-06 [0, 4.91e-06]
1998	7.22e-06 [0, 7.22e-06]
1999	1.28e-07 [0, 1.28e-07]
2000	1.83e-07 [0, 1.83e-07]

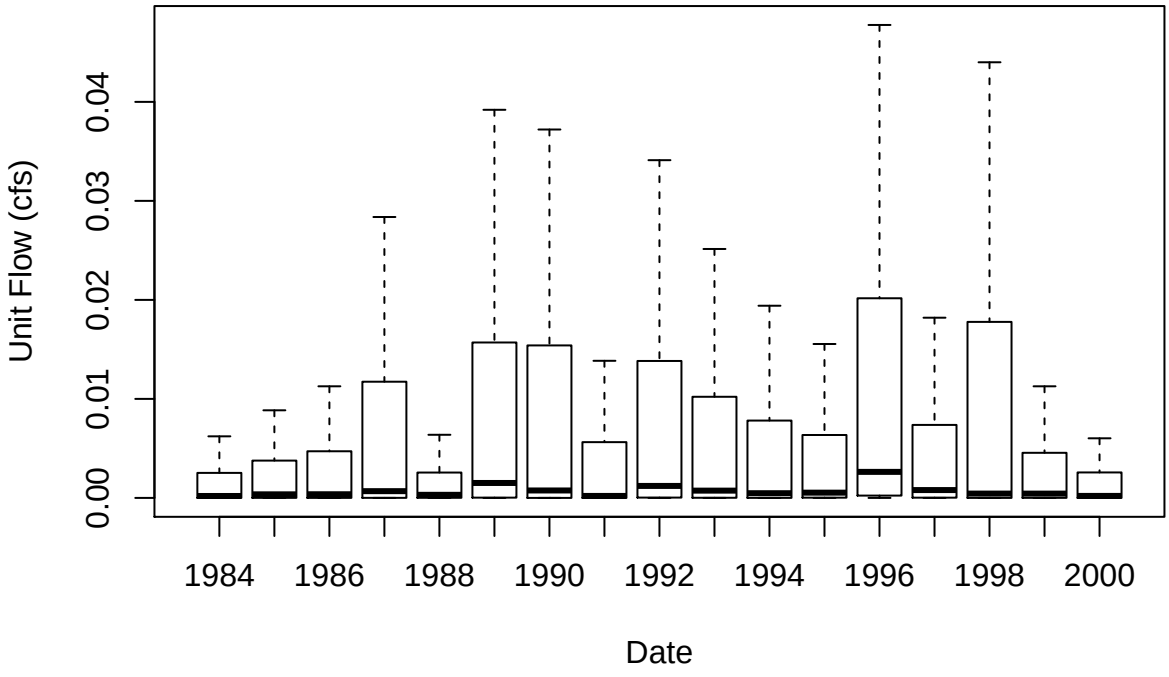
Fig: Boxplot of Annual SURO Flows for LR-seg cbp6_N51121_JU1_7690_7490



tab.IFWO.cbp6_N51121_JU1_7690_7490.iqr.by.lrseg.flow.annual

	IQR of Unit Flows (cfs/sq. mi) [25th, 75th]
1984	1.94e-05 [0, 1.94e-05]
1985	2.59e-05 [0, 2.59e-05]
1986	3.87e-05 [0, 3.87e-05]
1987	8.93e-05 [0, 8.93e-05]
1988	2.18e-05 [0, 2.18e-05]
1989	0.00016 [0, 0.00016]
1990	0.000143 [0, 0.000143]
1991	2.81e-05 [0, 2.81e-05]
1992	0.000115 [0, 0.000115]
1993	8.22e-05 [0, 8.22e-05]
1994	7.39e-05 [0, 7.39e-05]
1995	5.49e-05 [0, 5.49e-05]
1996	0.000256 [0, 0.000256]
1997	6.73e-05 [0, 6.73e-05]
1998	0.000102 [0, 0.000102]
1999	3.96e-05 [0, 3.96e-05]
2000	2.35e-05 [0, 2.35e-05]

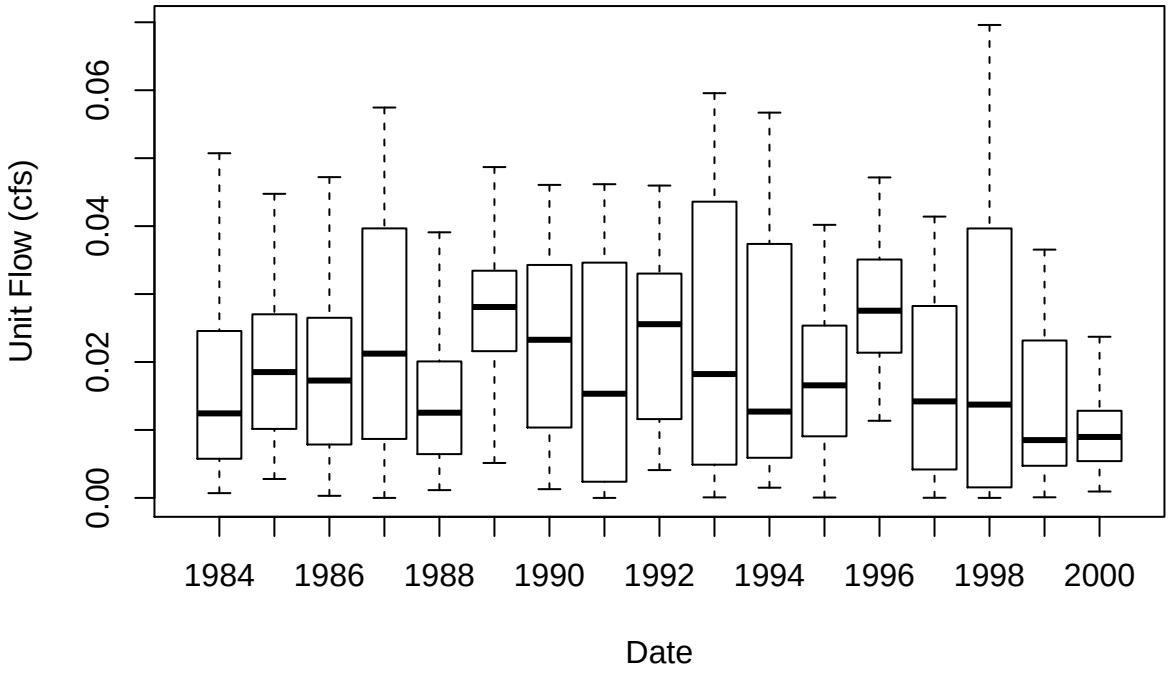
Fig: Boxplot of Annual IFWO Flows for LR-seg cbp6_N51121_JU1_7690_7490



tab.AGWO.cbp6_N51121_JU1_7690_7490.iqr.by.lrseg.flow.annual

	IQR of Unit Flows (cfs/sq. mi) [25th, 75th]
1984	0.000606 [0, 0.000606]
1985	0.000759 [0, 0.000759]
1986	0.000764 [0, 0.000764]
1987	0.000983 [0, 0.000983]
1988	0.000563 [0, 0.000563]
1989	0.00108 [0, 0.00108]
1990	0.000965 [0, 0.000965]
1991	0.000852 [0, 0.000852]
1992	0.000987 [0, 0.000987]
1993	0.00103 [0, 0.00103]
1994	0.000803 [0, 0.000803]
1995	0.000687 [0, 0.000687]
1996	0.00109 [0, 0.00109]
1997	0.000698 [0, 0.000698]
1998	0.000956 [0, 0.000956]
1999	0.000489 [0, 0.000489]
2000	0.000399 [0, 0.000399]

Fig: Boxplot of Annual AGWO Flows for LR-seg cbp6_N51121_JU1_7690_7490



tab.cbp6__N51121__JU1__7690__7490.means.by.land.use

	Mean Unit Flow (cfs/sq. mi)
aop	0.000488
cch	0.000642
cci	0.00104
ccn	0.000688
cfr	0.000448
cir	0.00104
cmo	0.000467
cnr	0.00104
ctg	0.000642
dbl	0.000519
fnp	0.00104
for	0.000448
fsp	0.00104
gom	0.000519
gwm	0.000519
hfr	0.00052
lhy	0.000488
mch	0.000642
mci	0.00104
mcn	0.000688
mir	0.00104
mnr	0.00104
mtg	0.000642
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nci	0.00104
nir	0.00104
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pas	0.000488
sch	0.000519
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sgg	0.000519
sho	0.00104
som	0.000519
soy	0.000519
stb	0.00104
stf	0.00104
swm	0.000519
wfp	0.000448
wto	0.000448

tab.cbp6_N51121_JU1_7690_7490.zero.day.ratios.by.land.use

	Ratio of Days with Zero Flow to Total Days
aop	0.328
cch	0.333
cci	0.895
ccn	0.302
cfr	0.393
cir	0.895
cmo	0.349
cnr	0.895
ctg	0.333
dbl	0.318
fnp	0.894
for	0.401
fsp	0.894
gom	0.318
gwm	0.318
hfr	0.327
lhy	0.329
mch	0.333
mci	0.895
mcn	0.302
mir	0.895
mnr	0.895
mtg	0.333
nch	0.333
nci	0.895
nir	0.895
nnr	0.895
ntg	0.333
oac	0.318
ohy	0.329
osp	0.351
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$featureid [1] 4836252

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	Mean Unit Flow (cfs/sq. mi)
SURface Outflow	0.00146
InterFloW Outflow	0.000295
Active GroundWater Outflow	0.000571

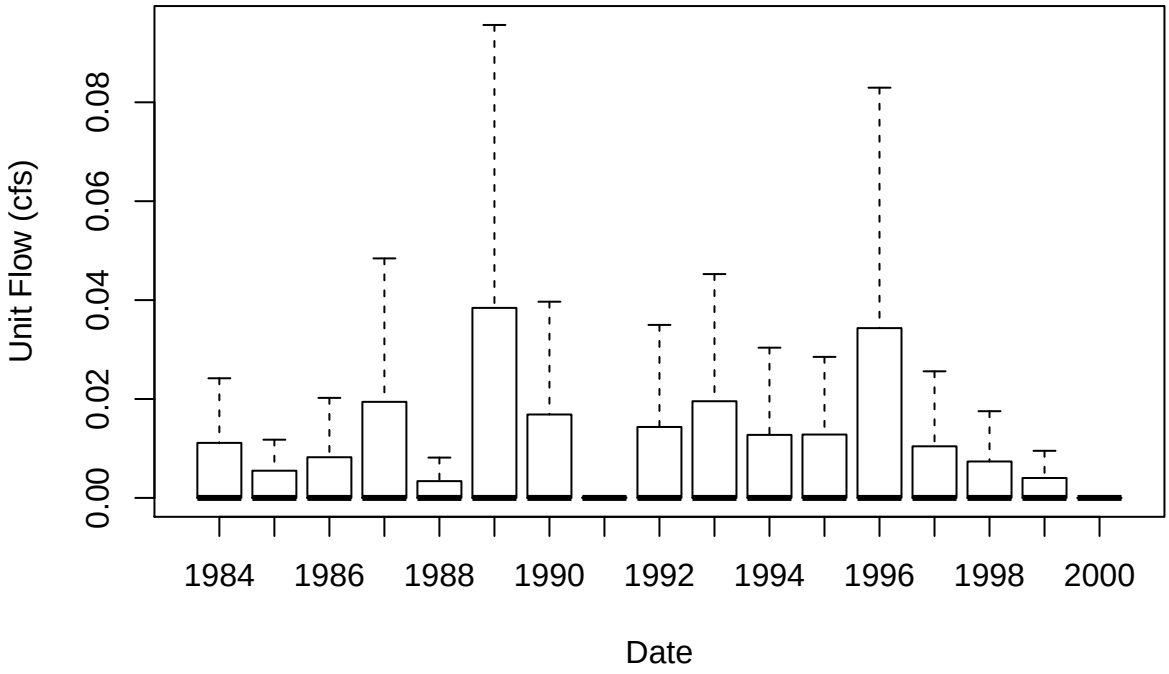
tab.cbp6_N51161_JU1_7690_7490.zero.day.ratios.by.flow

	Ratio of Days with Zero Flow to Total Days
SURface Outflow	0.681
InterFloW Outflow	0.442
Active GroundWater Outflow	0.326

tab.SURO.cbp6_N51161_JU1_7690_7490.iqr.by.lrseg.flow.annual

	IQR of Unit Flows (cfs/sq. mi) [25th, 75th]
1984	5.93e-07 [0, 5.93e-07]
1985	1.12e-06 [0, 1.12e-06]
1986	1.69e-06 [0, 1.69e-06]
1987	9.16e-06 [0, 9.16e-06]
1988	5.44e-07 [0, 5.44e-07]
1989	1.93e-05 [0, 1.93e-05]
1990	8.61e-06 [0, 8.61e-06]
1991	2.04e-09 [0, 2.04e-09]
1992	5.94e-06 [0, 5.94e-06]
1993	9.54e-06 [0, 9.54e-06]
1994	5.07e-06 [0, 5.07e-06]
1995	3.64e-06 [0, 3.64e-06]
1996	3.01e-05 [0, 3.01e-05]
1997	3.92e-06 [0, 3.92e-06]
1998	1.99e-06 [0, 1.99e-06]
1999	5.36e-07 [0, 5.36e-07]
2000	2.85e-10 [0, 2.85e-10]

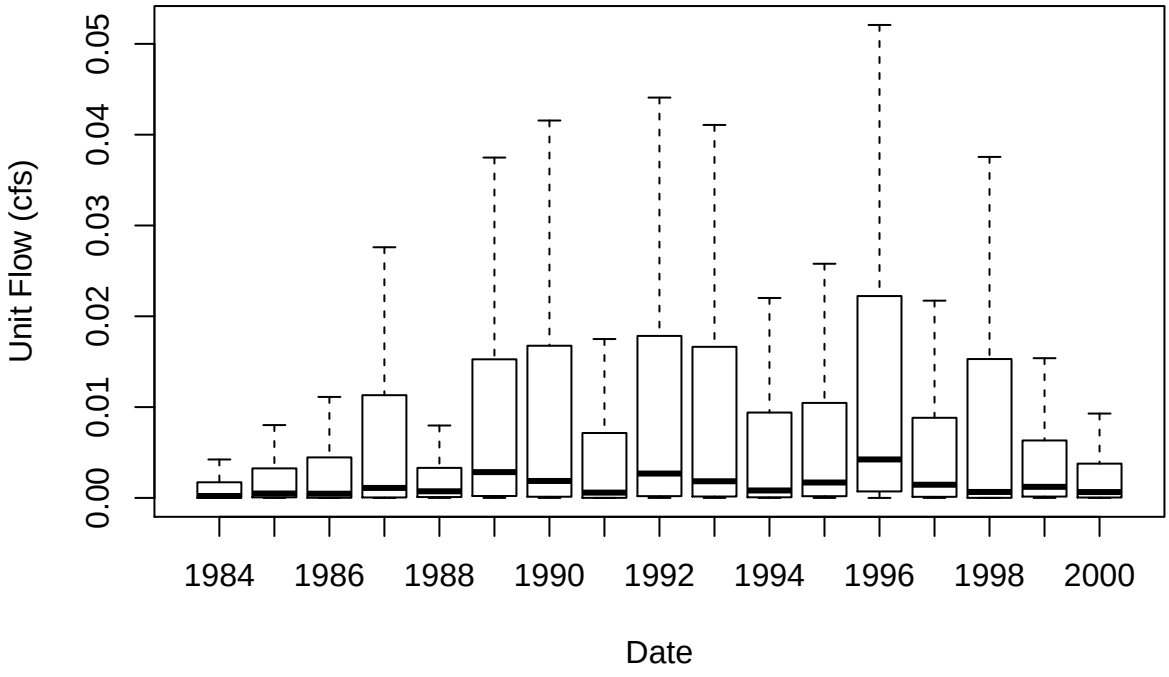
Fig: Boxplot of Annual SURO Flows for LR-seg cbp6_N51161_JU1_7690_7490



tab.IFWO.cbp6_N51161_JU1_7690_7490.iqr.by.lrseg.flow.annual

	IQR of Unit Flows (cfs/sq. mi) [25th, 75th]
1984	1.82e-05 [0, 1.82e-05]
1985	3.44e-05 [0, 3.44e-05]
1986	3.64e-05 [0, 3.64e-05]
1987	0.000102 [0, 0.000102]
1988	3.84e-05 [0, 3.84e-05]
1989	0.000201 [0, 0.000201]
1990	0.000212 [0, 0.000212]
1991	6.31e-05 [0, 6.31e-05]
1992	0.00021 [0, 0.00021]
1993	0.000182 [0, 0.000182]
1994	7.97e-05 [0, 7.97e-05]
1995	0.00012 [0, 0.00012]
1996	0.000323 [0, 0.000323]
1997	0.000114 [0, 0.000114]
1998	8.86e-05 [0, 8.86e-05]
1999	7.85e-05 [0, 7.85e-05]
2000	5.23e-05 [0, 5.23e-05]

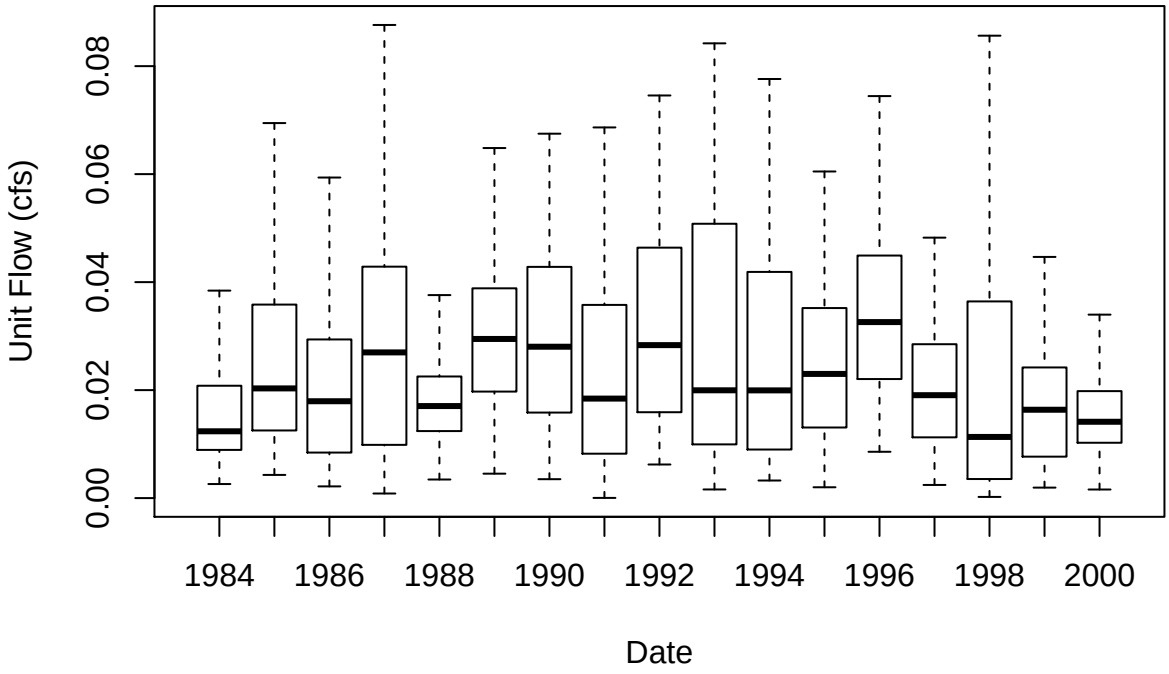
Fig: Boxplot of Annual IFWO Flows for LR-seg cbp6_N51161_JU1_7690_7490



tab.AGWO.cbp6_N51161_JU1_7690_7490.iqr.by.lrseg.flow.annual

	IQR of Unit Flows (cfs/sq. mi) [25th, 75th]
1984	0.000535 [0, 0.000535]
1985	0.000876 [0, 0.000876]
1986	0.000777 [0, 0.000777]
1987	0.00117 [0, 0.00117]
1988	0.000673 [0, 0.000673]
1989	0.00115 [0, 0.00115]
1990	0.00116 [0, 0.00116]
1991	0.000878 [0, 0.000878]
1992	0.00117 [0, 0.00117]
1993	0.00119 [0, 0.00119]
1994	0.000962 [0, 0.000962]
1995	0.000946 [0, 0.000946]
1996	0.0013 [0, 0.0013]
1997	0.000778 [0, 0.000778]
1998	0.000723 [0, 0.000723]
1999	0.000704 [0, 0.000704]
2000	0.000577 [0, 0.000577]

Fig: Boxplot of Annual AGWO Flows for LR-seg cbp6_N51161_JU1_7690_7490



tab.cbp6__N51161__JU1__7690__7490.means.by.land.use

	Mean Unit Flow (cfs/sq. mi)
aop	0.000538
cch	0.000705
cci	0.00116
ccn	0.000722
cfr	0.0005
cir	0.00116
cmo	0.000509
cnr	0.00116
ctg	0.000705
dbl	0.000564
fnp	0.00116
for	0.0005
fsp	0.00116
gom	0.000564
gwm	0.000564
hfr	0.000594
lhy	0.000538
mch	0.000705
mci	0.00116
mcn	0.000722
mir	0.00116
mnr	0.00116
mtg	0.000705
nch	0.000705
nci	0.00116
nir	0.00116
nnr	0.00116
ntg	0.000705
oac	0.000564
ohy	0.000538
osp	0.000509
pas	0.000538
sch	0.000564
scl	0.000564
sgg	0.000564
sho	0.00116
som	0.000564
soy	0.000564
stb	0.00116
stf	0.00116
swm	0.000564
wfp	0.0005
wto	0.0005

tab.cbp6__N51161__JU1__7690__7490.zero.day.ratios.by.land.use

	Ratio of Days with Zero Flow to Total Days
aop	0.278
cch	0.28
cci	0.897
ccn	0.267
cfr	0.306
cir	0.897
cmo	0.294
cnr	0.897
ctg	0.28
dbl	0.277
fnp	0.9
for	0.311
fsp	0.9
gom	0.277
gwm	0.277
hfr	0.272
lhy	0.281
mch	0.28
mci	0.897
mcn	0.267
mir	0.897
mnr	0.897
mtg	0.28
nch	0.28
nci	0.897
nir	0.897
nnr	0.897
ntg	0.28
oac	0.277
ohy	0.281
osp	0.295
pas	0.281
sch	0.277
scl	0.277
sgg	0.277
sho	0.897
som	0.277
soy	0.277
stb	0.897
stf	0.897
swm	0.277
wfp	0.311
wto	0.311

Fig. 1: Hydrograph

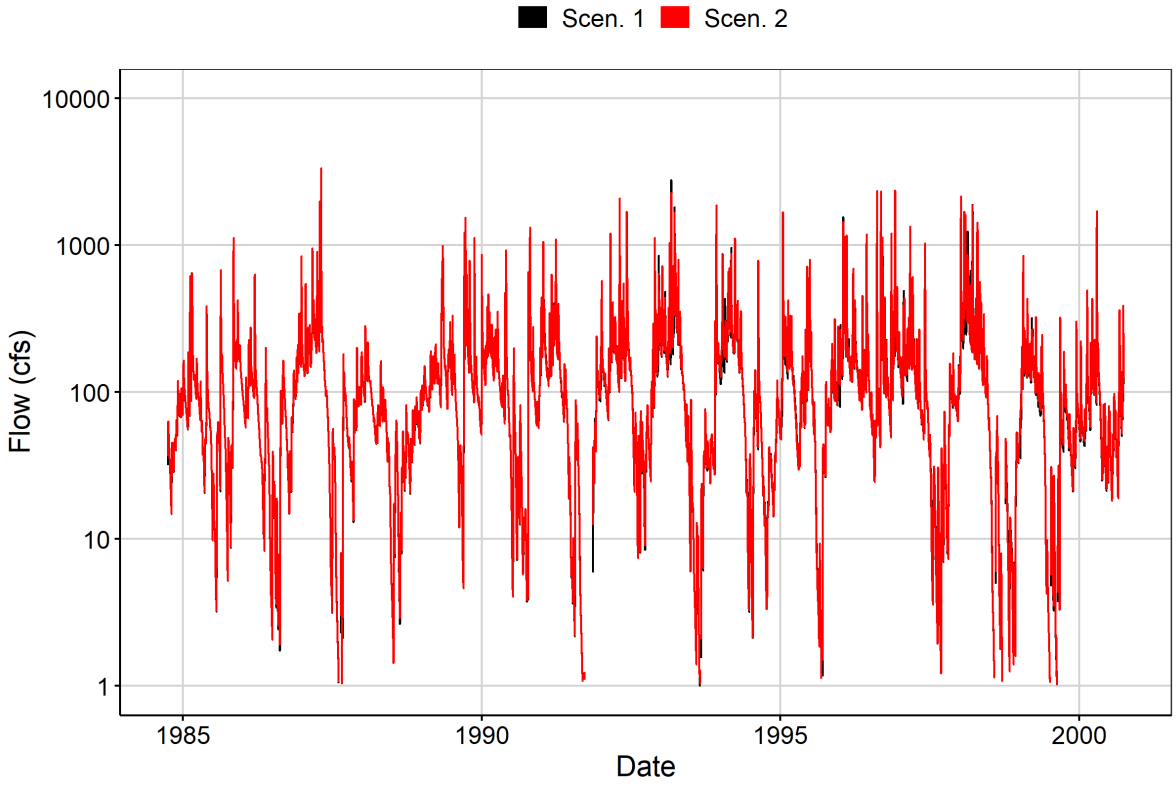


Fig. 2: Zoomed Hydrograph

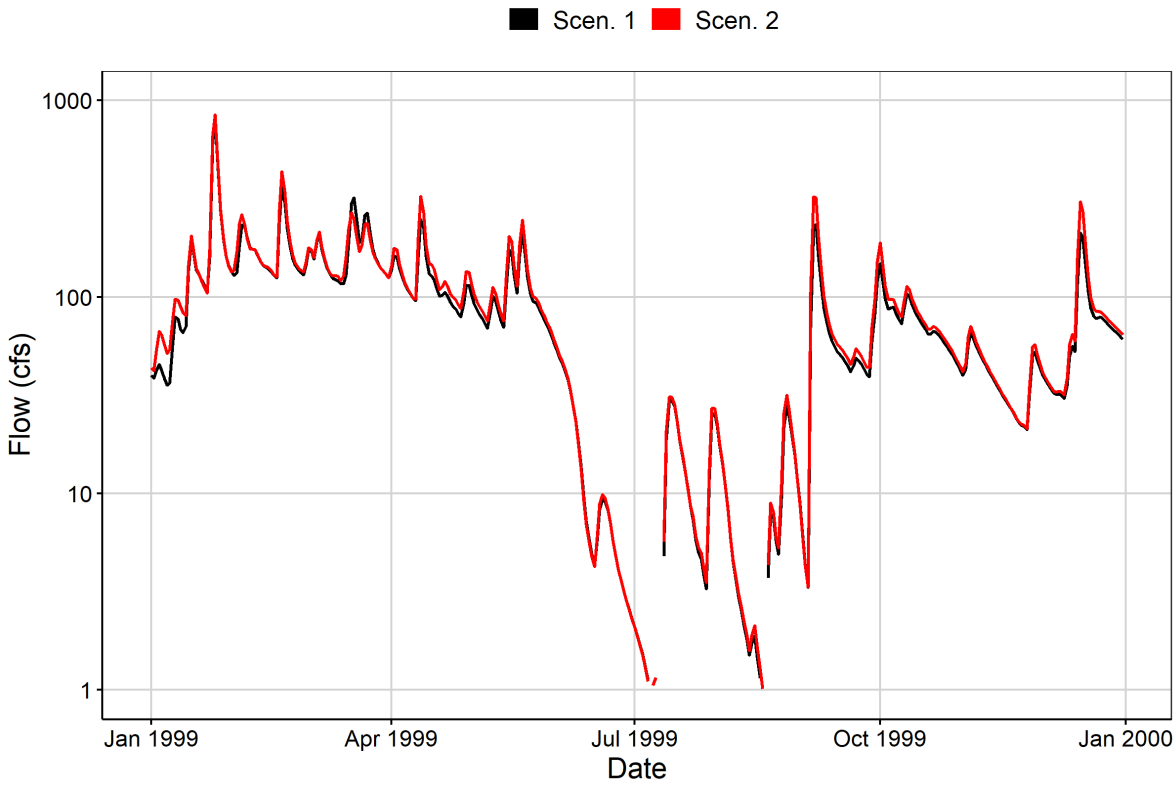


Fig. 3: Flow Exceedance

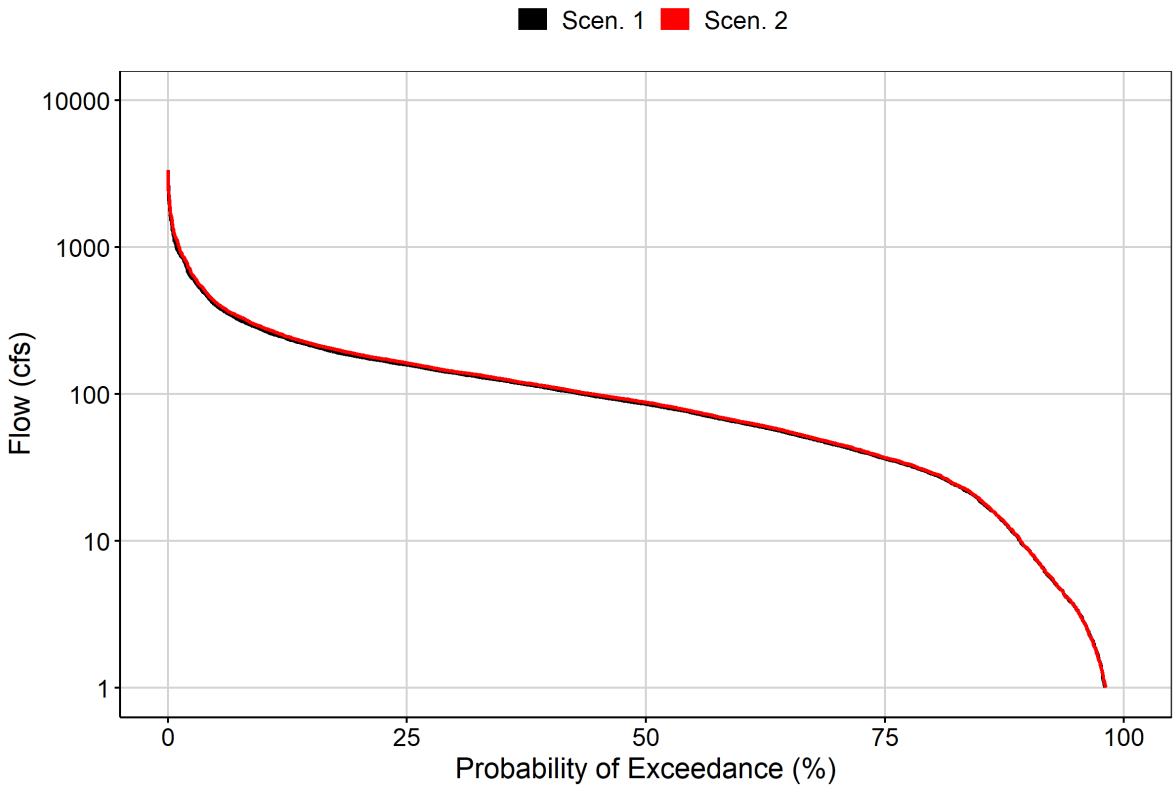


Fig. 4: Baseflow

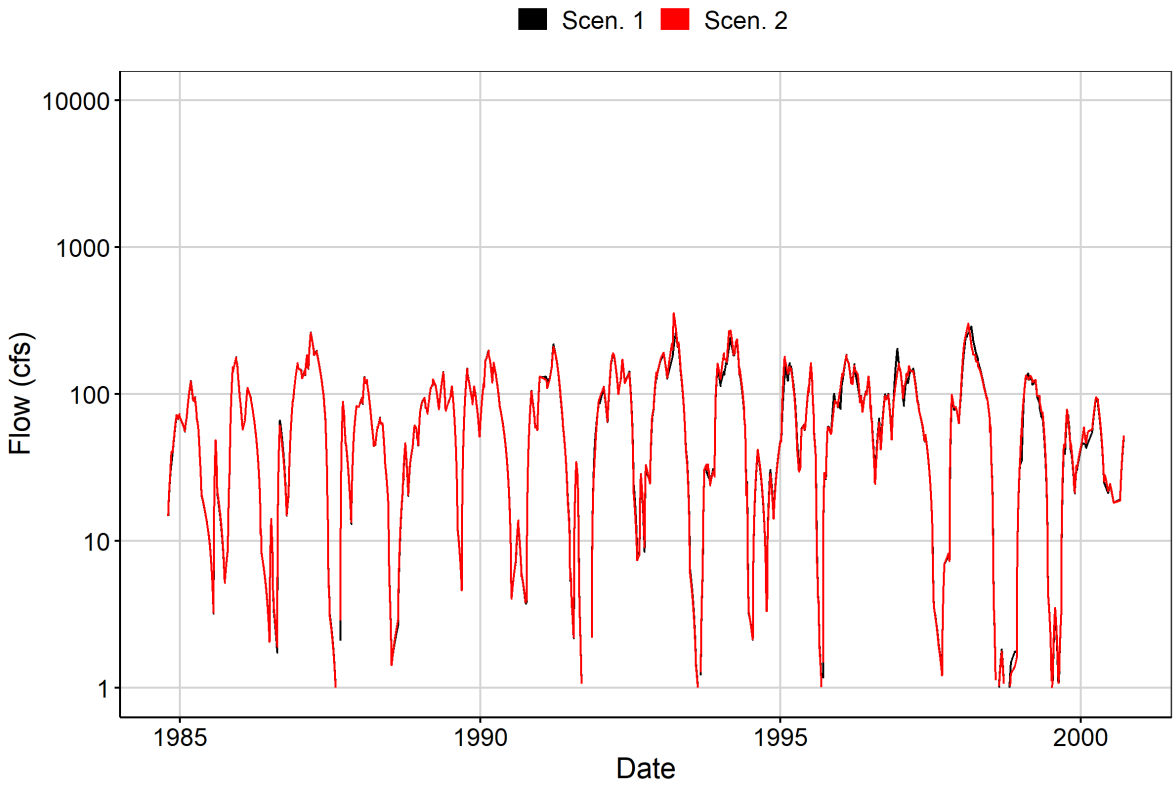


Fig. 5: Combined Baseflow

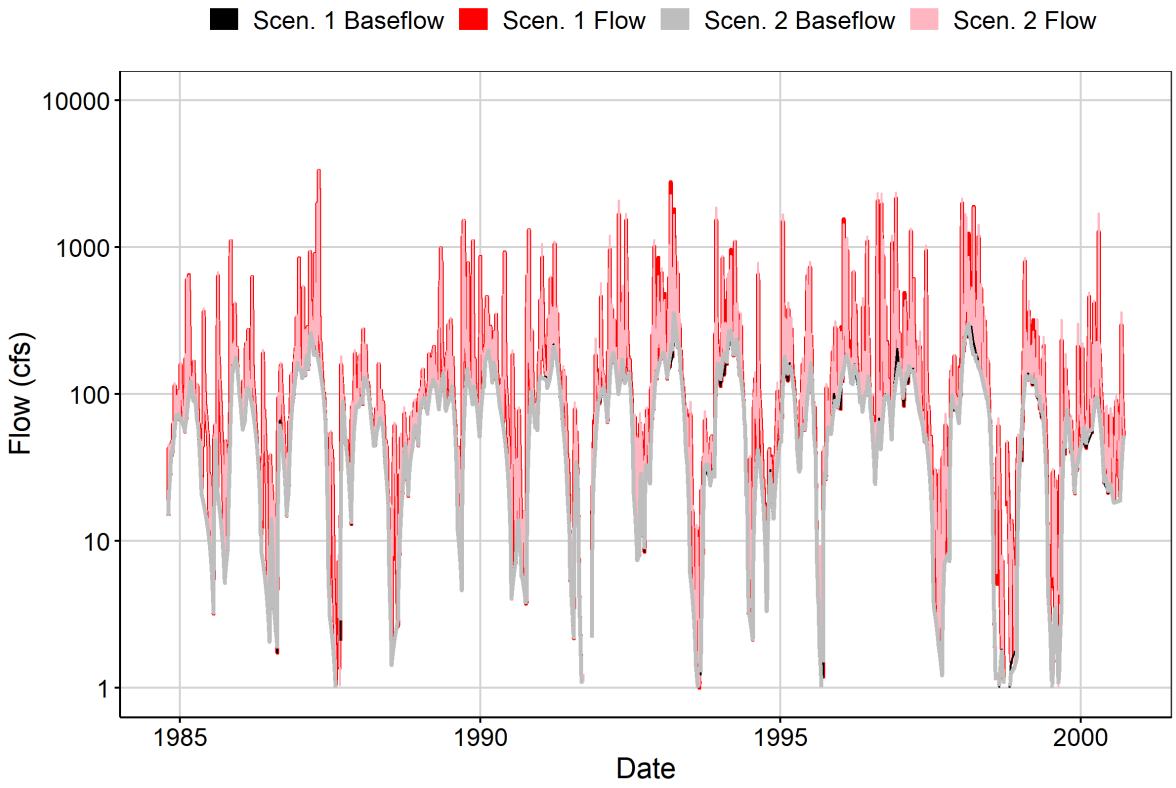


Fig. 6: Largest Difference Period

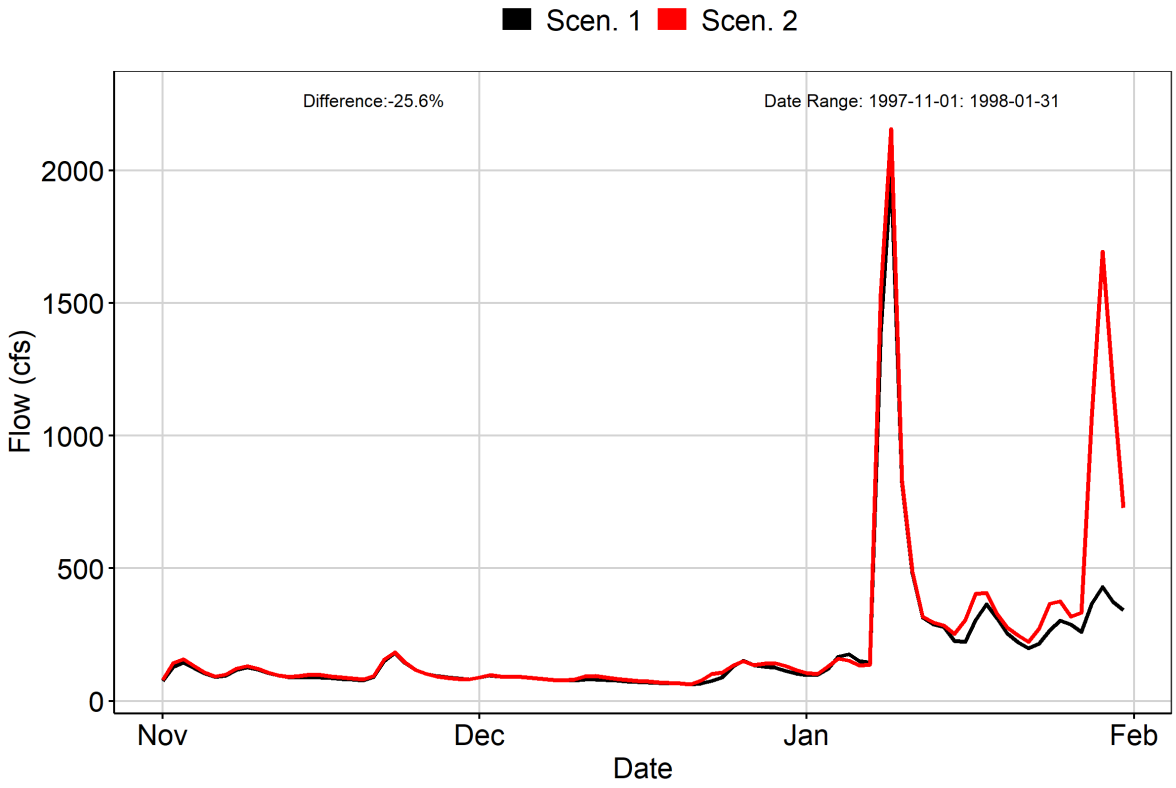


Fig. 7: Second Largest Difference Period

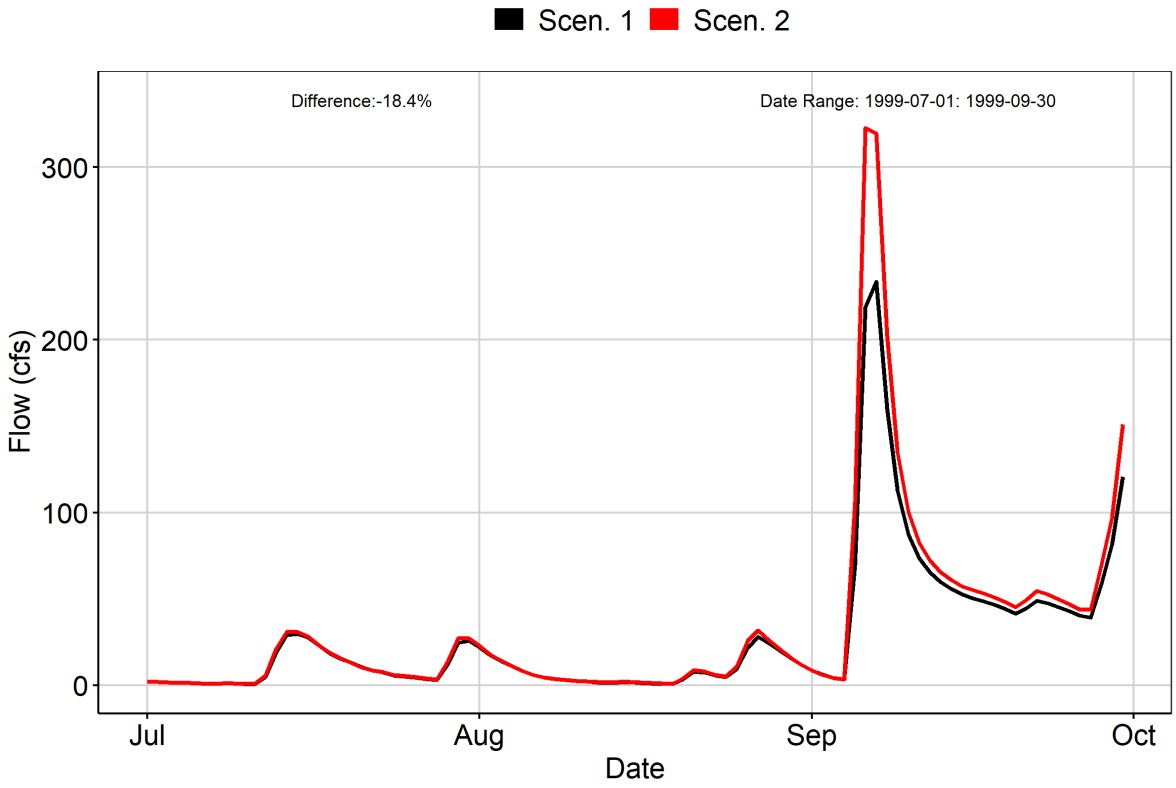


Fig. 8: Third Largest Difference Period

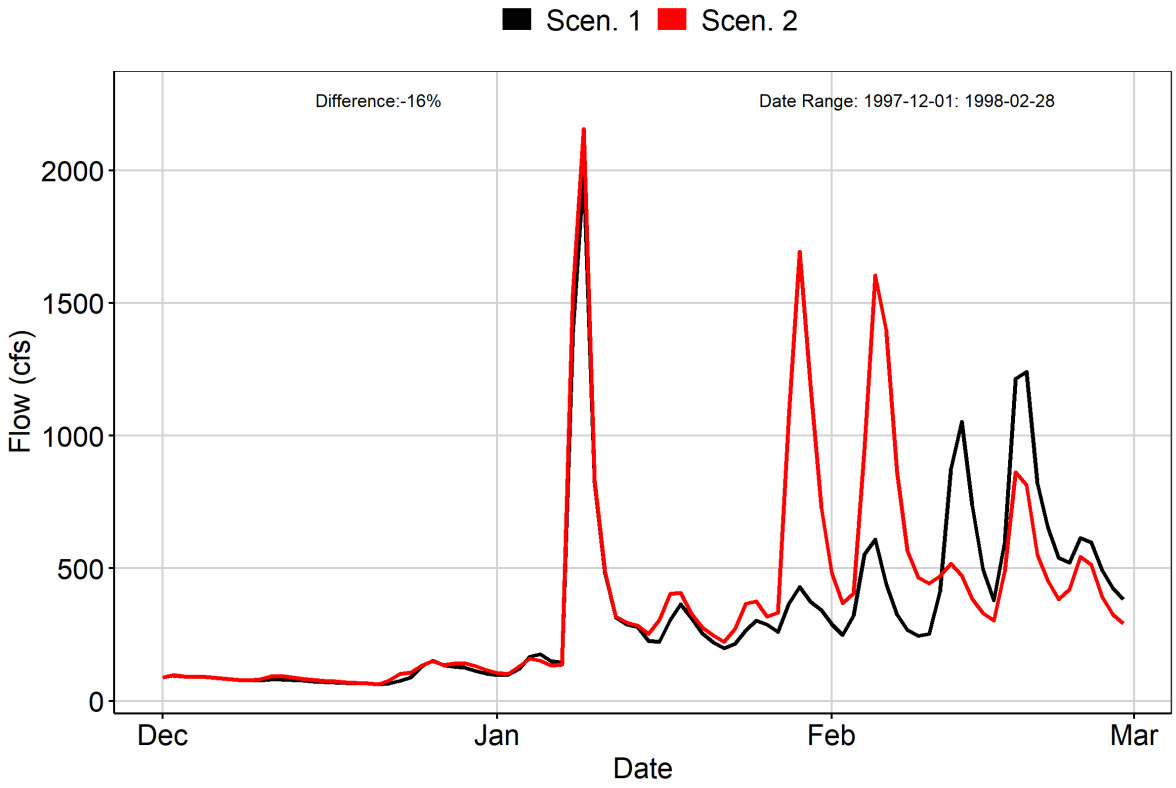


Fig. 9A: Residuals Plot

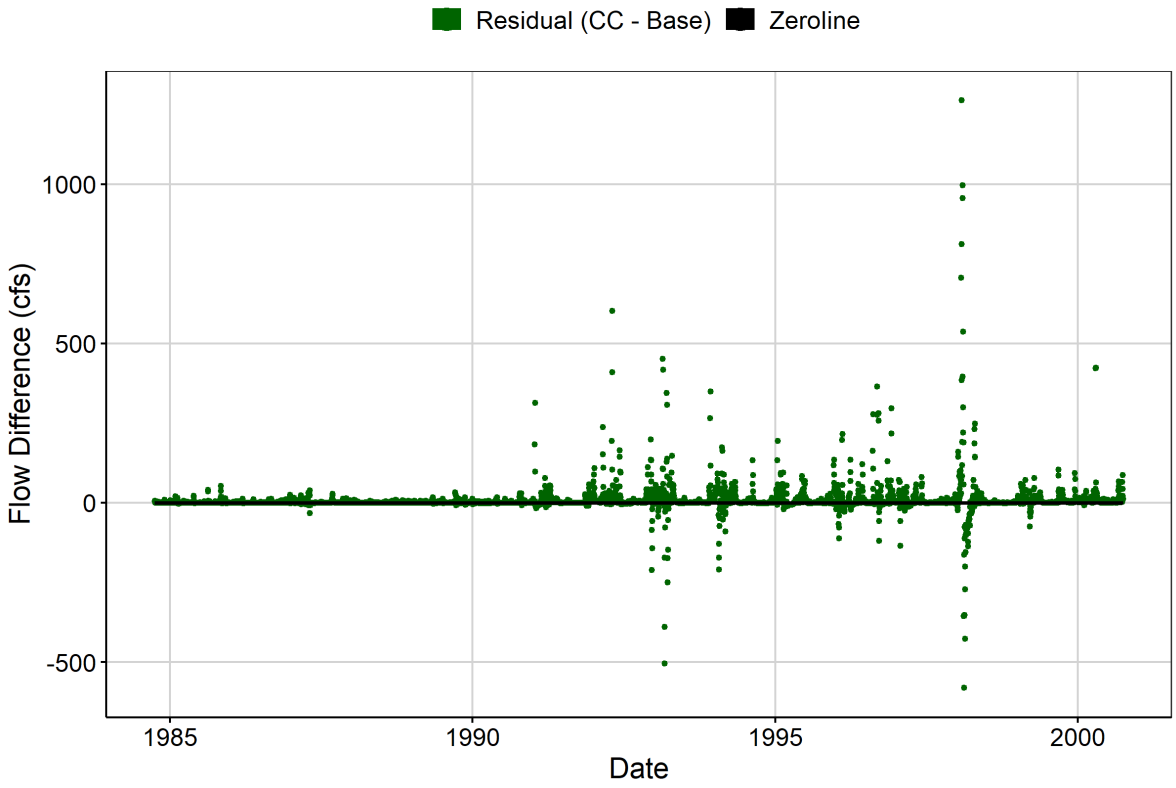


Fig. 9B: Area Weighted Residuals Plot

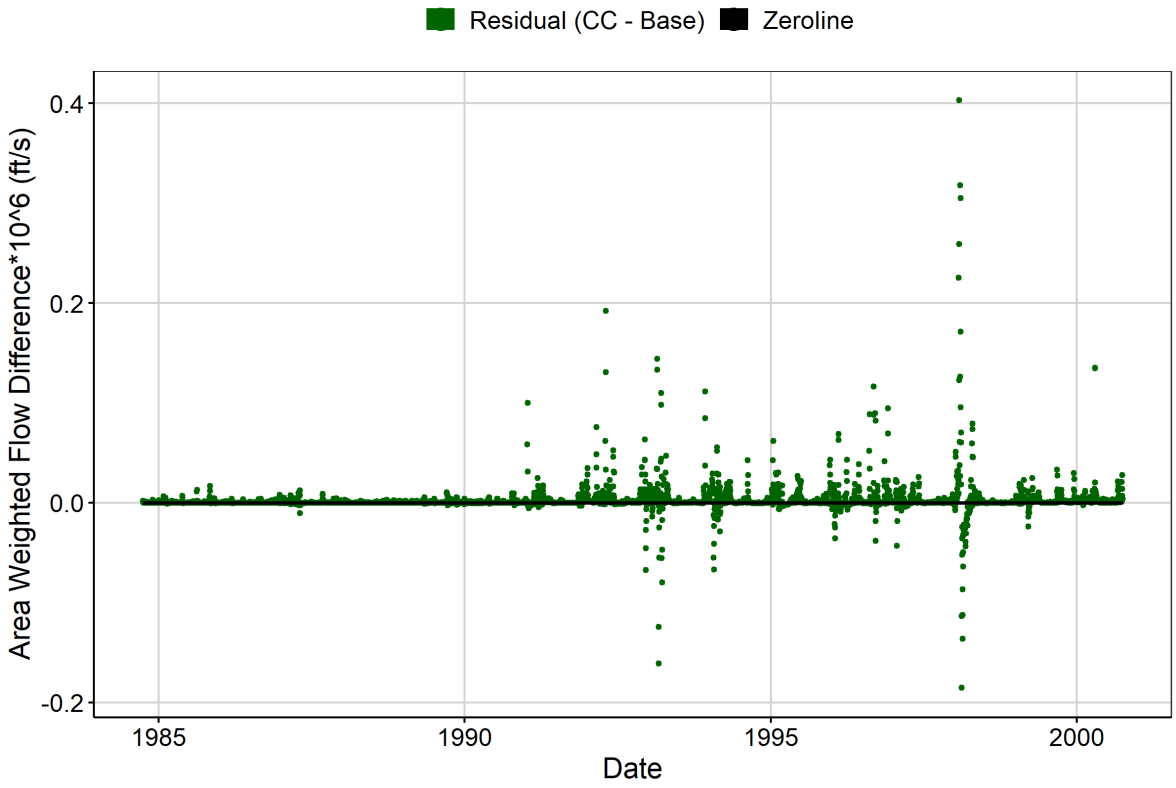
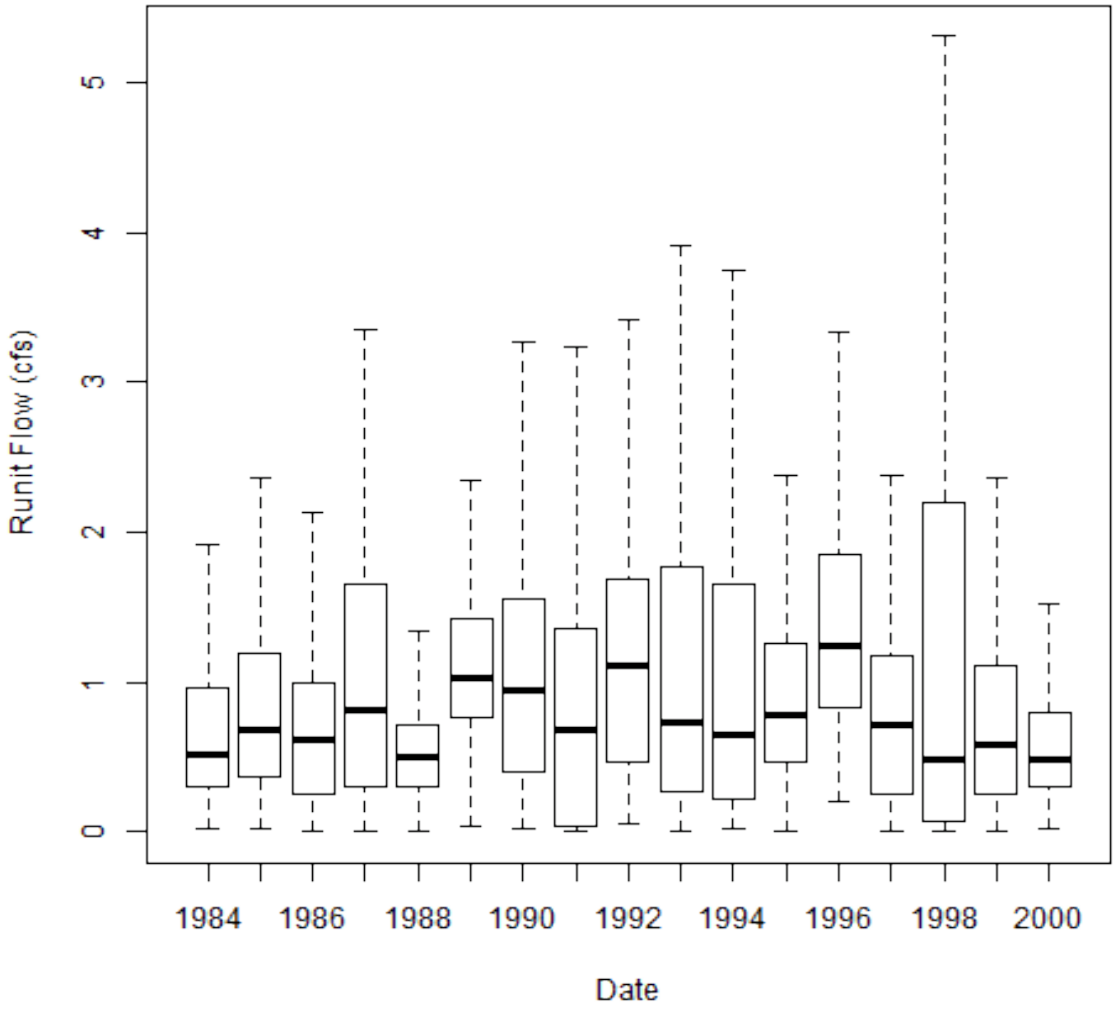


Fig. 10: VA Hydro Scen. 1 Runit Values (Outliers Excluded)



	IQR of Runit Flows (cfs/sq. mi) [25th, 75th]
1984	1.04 [0.312, 1.35]
1985	1.04 [0.312, 1.35]
1986	1.04 [0.312, 1.35]
1987	1.04 [0.312, 1.35]
1988	1.04 [0.312, 1.35]
1989	1.04 [0.312, 1.35]
1990	1.04 [0.312, 1.35]
1991	1.04 [0.312, 1.35]
1992	1.04 [0.312, 1.35]
1993	1.04 [0.312, 1.35]
1994	1.04 [0.312, 1.35]
1995	1.04 [0.312, 1.35]

	IQR of Runit Flows (cfs/sq. mi) [25th, 75th]
1996	1.04 [0.312, 1.35]
1997	1.04 [0.312, 1.35]
1998	1.04 [0.312, 1.35]
1999	1.04 [0.312, 1.35]
2000	1.04 [0.312, 1.35]

Fig. 11: Smallest Difference Period

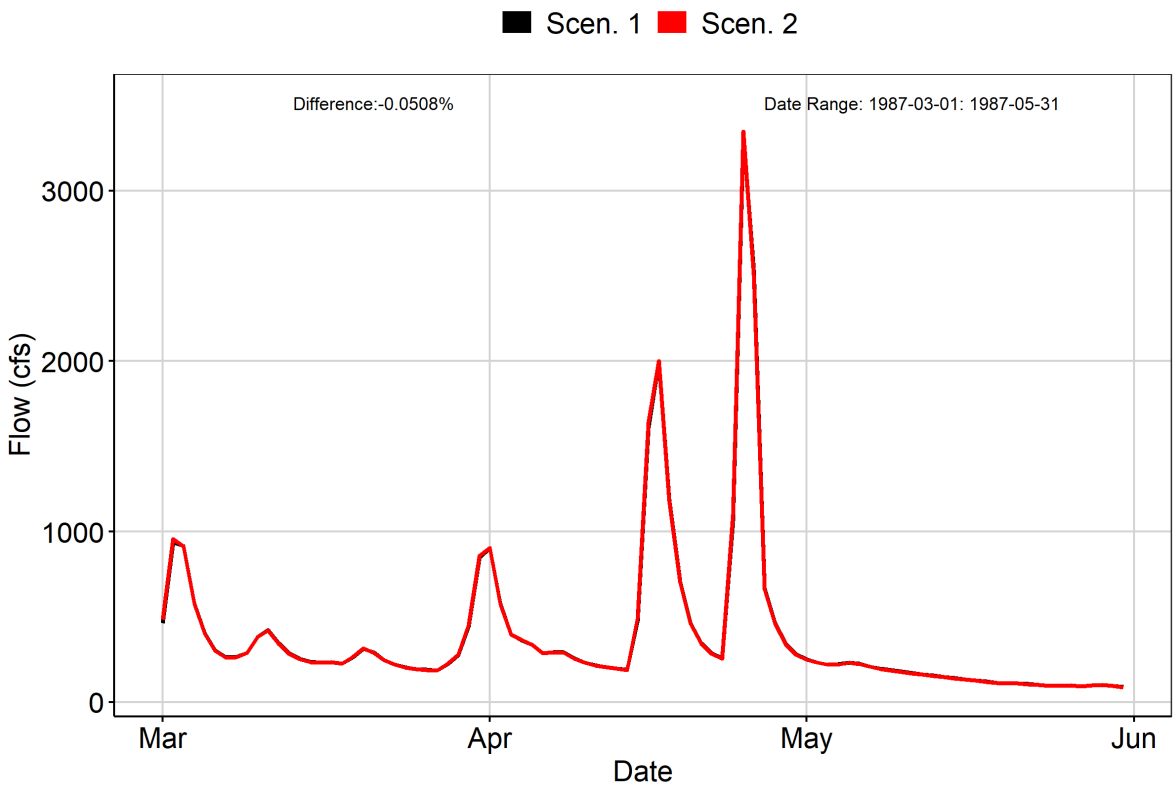


Fig. 12: Second Smallest Difference Period

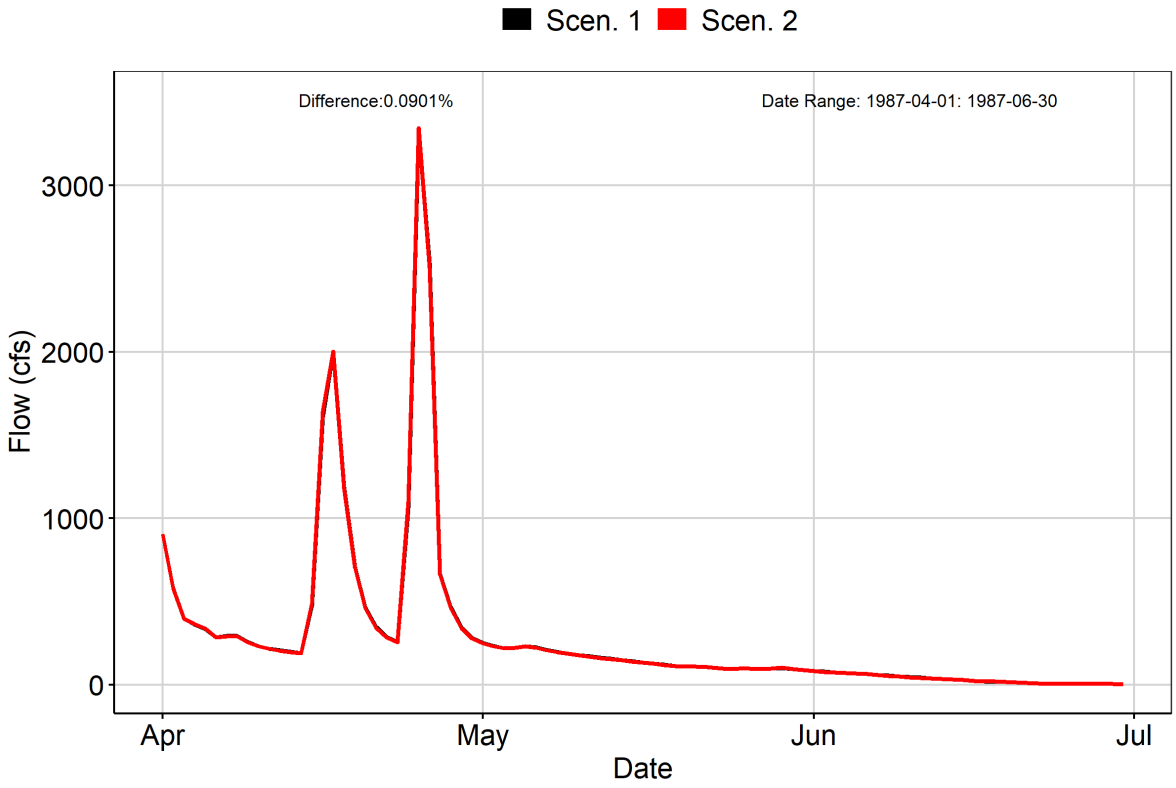


Fig. 13: Third Smallest Difference Period