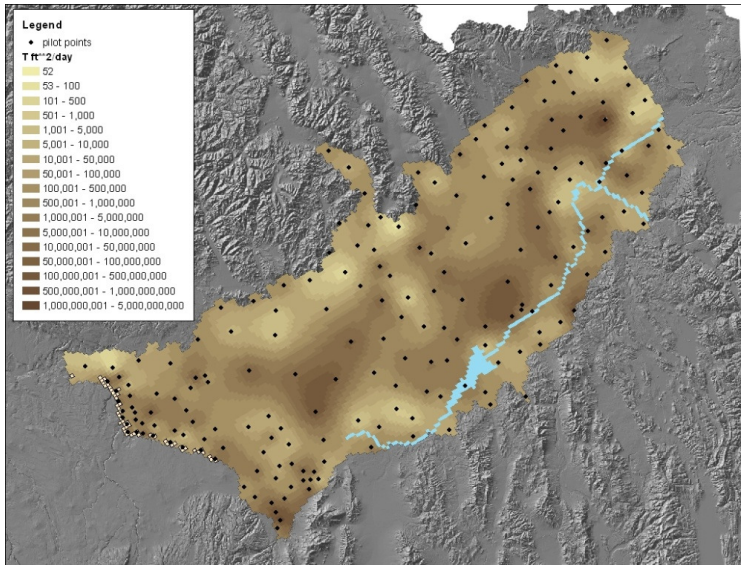
E120116A Comparisons

Allan Wylie IDWR

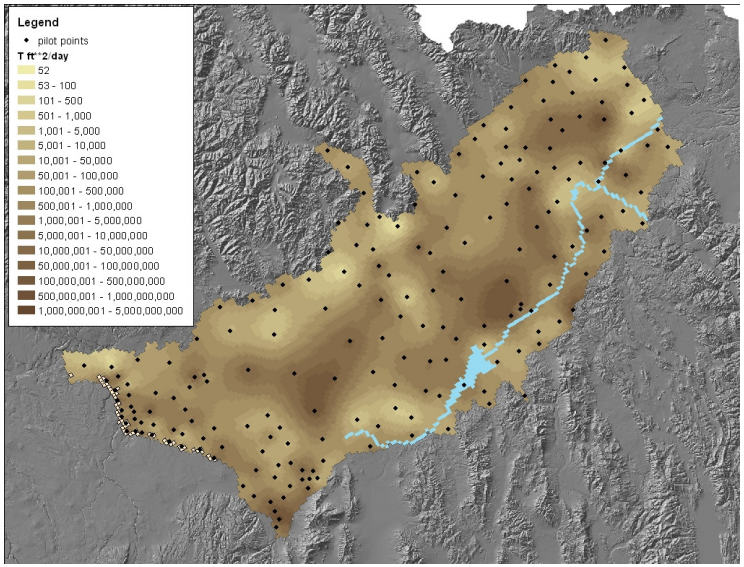
Reach Gain and Spring Discharge Targets

- Monthly Stress Periods
  - Using
    - MKMOD81.exe
      - Using On-Farm algorithm
    - E120106A
      - AFRD2 and Malad River seepage fixed
    - No steady state targets
    - Aquifer head
      - 1985-2008
    - Seasonal
      - Head difference on selected wells
    - Snake reach gain and loss targets
      - Updated through 2008 to match recharge data
      - 1985-2008
    - Spring discharge
      - Updated through 2008 to match recharge data
      - 1985-2008
    - Returns targets
      - Egin, Liberty, Great Feeder Group, Butte-Market Lake, Aberdeen-Springfield, BID, MID, and NSCCo

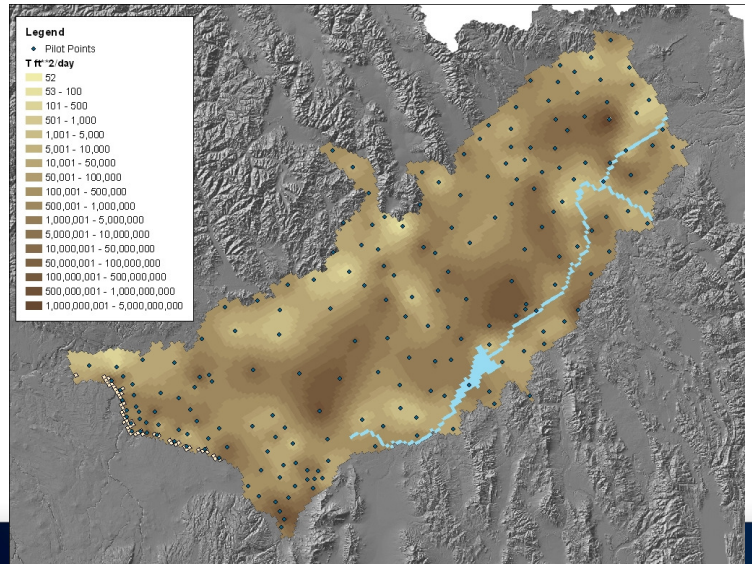
001



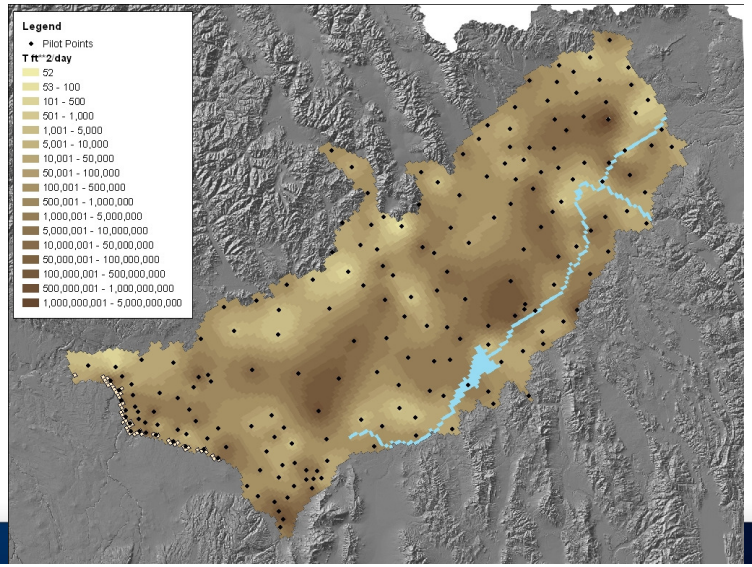
004



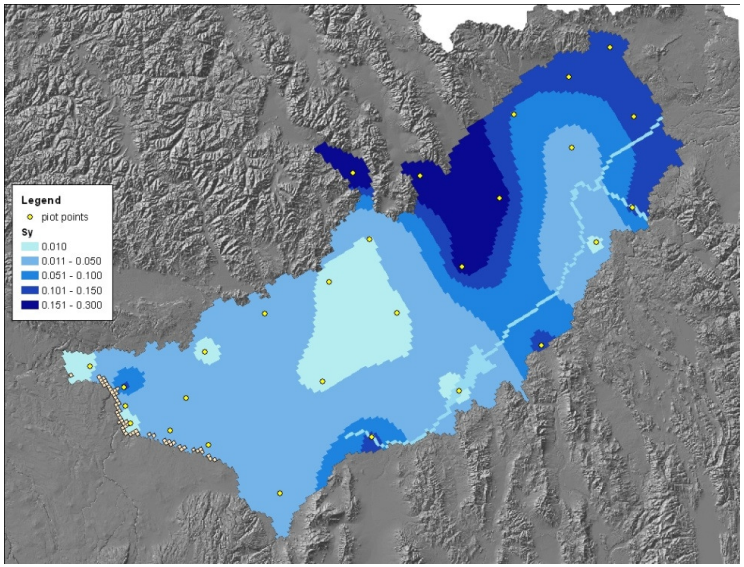
006



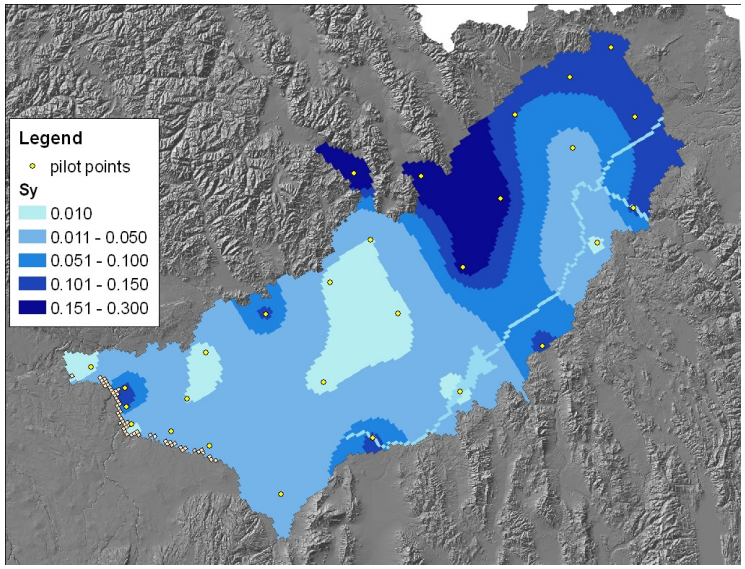
007



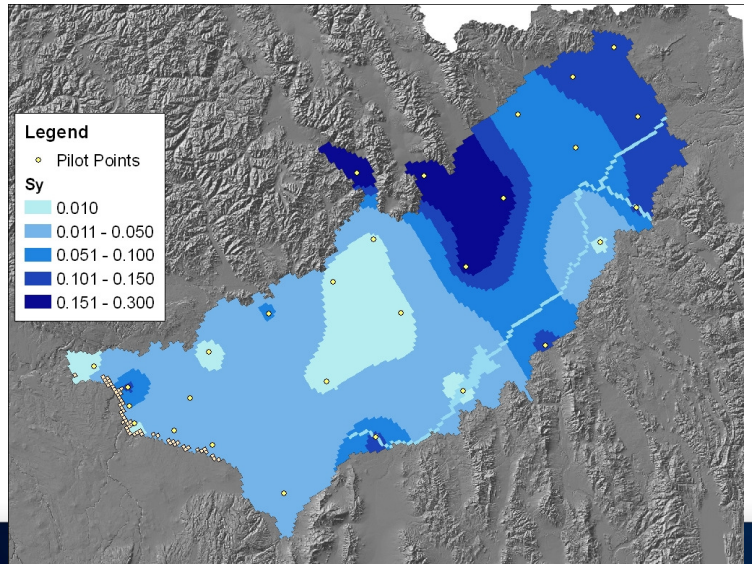
001



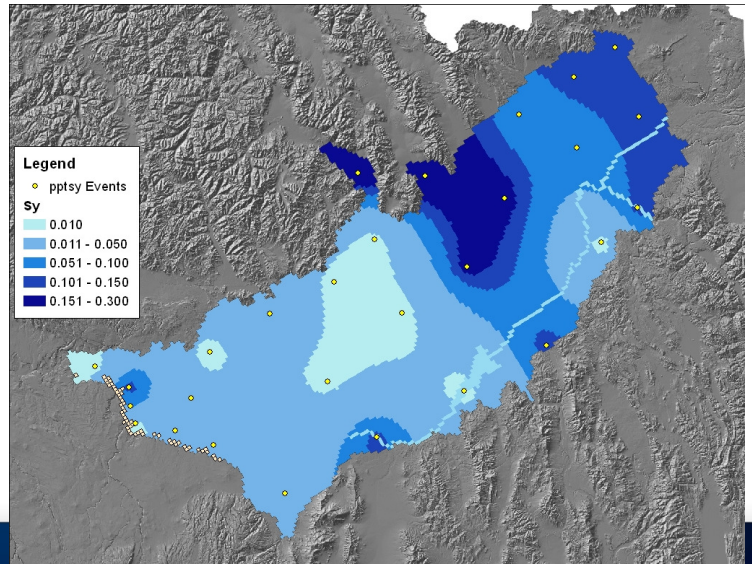
004



006

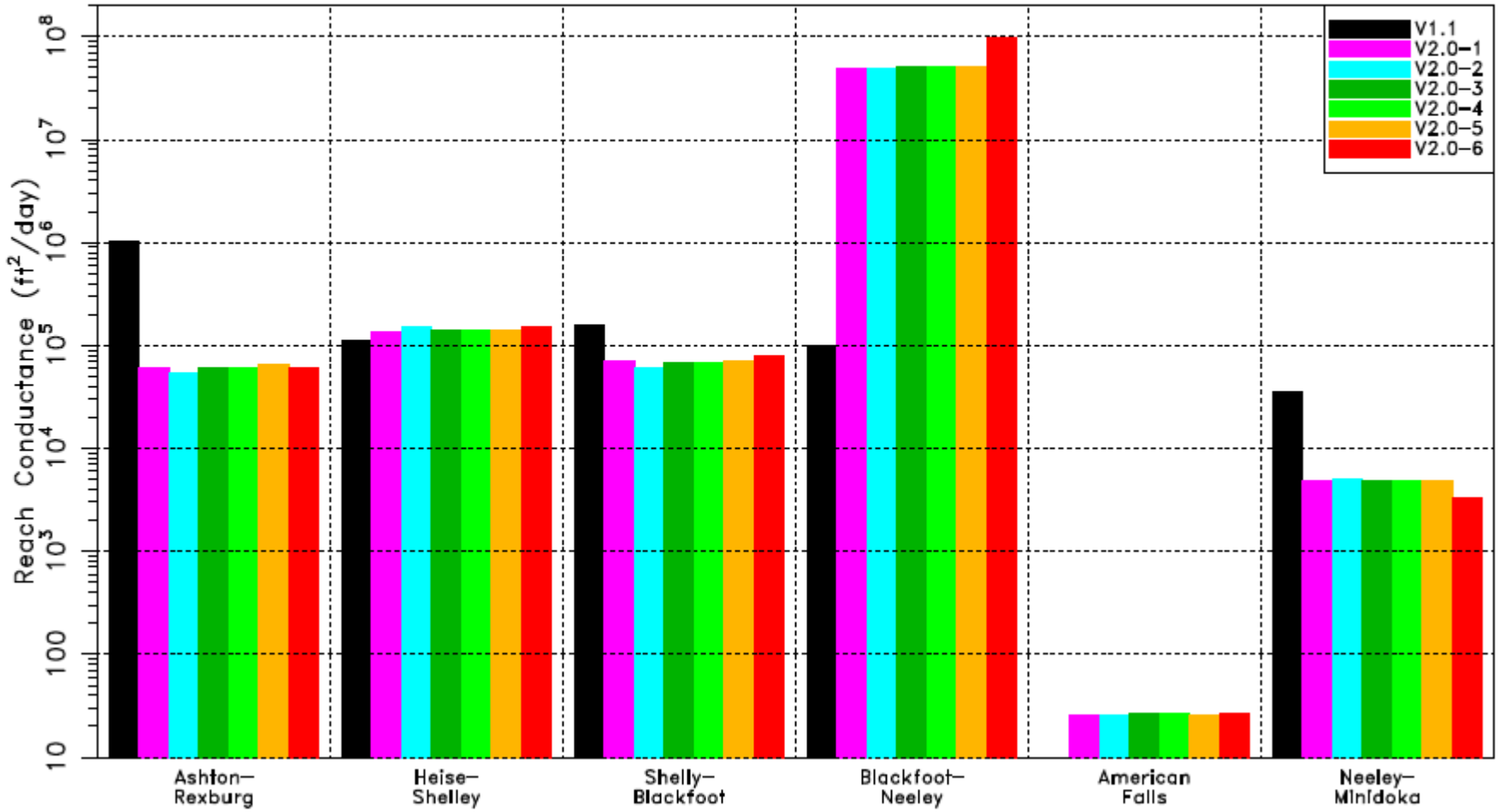


007



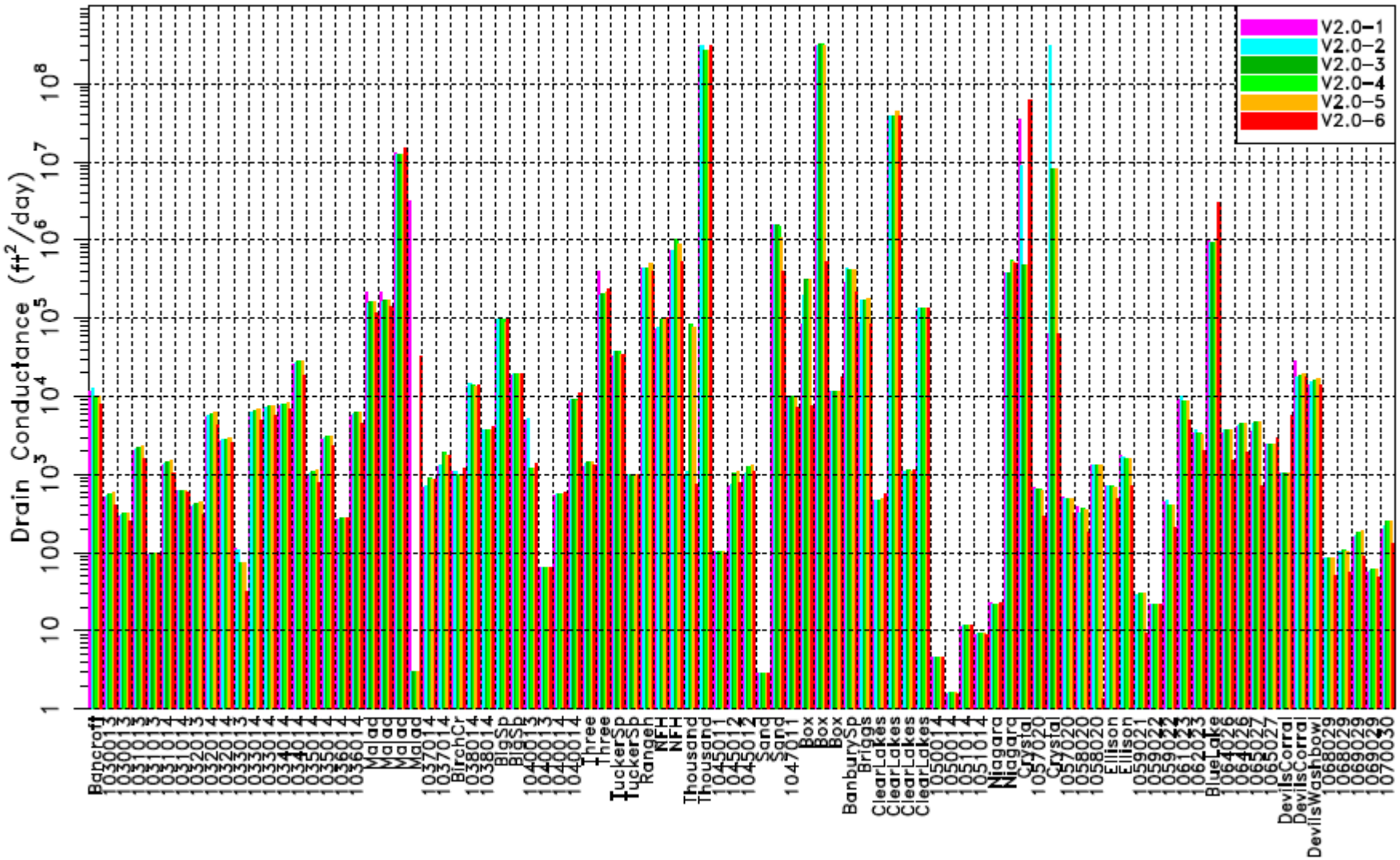
Reach Conductance

Eastern Snake Plain Aquifer Model



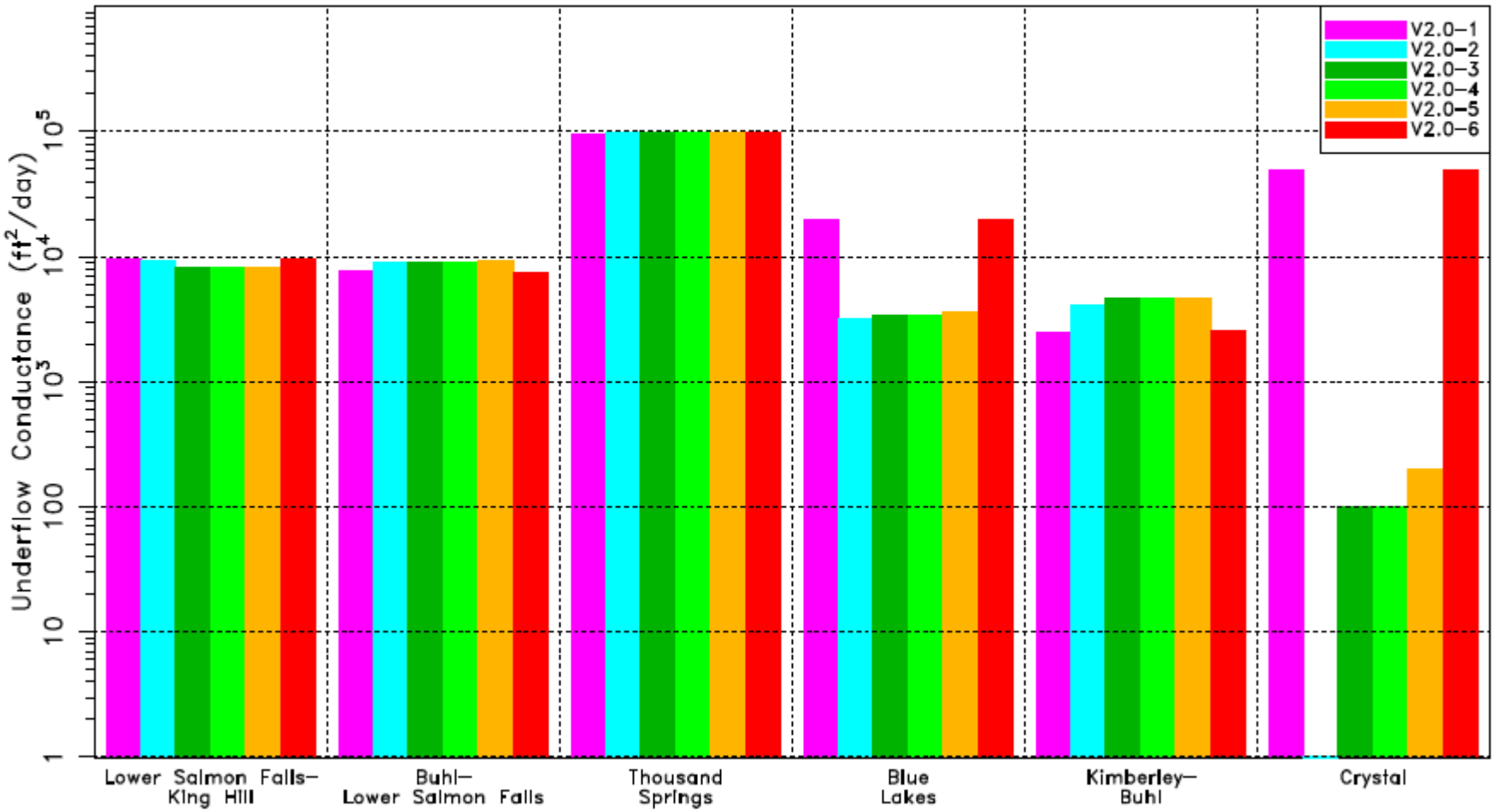
Drain Conductance

Eastern Snake Plain Aquifer Model



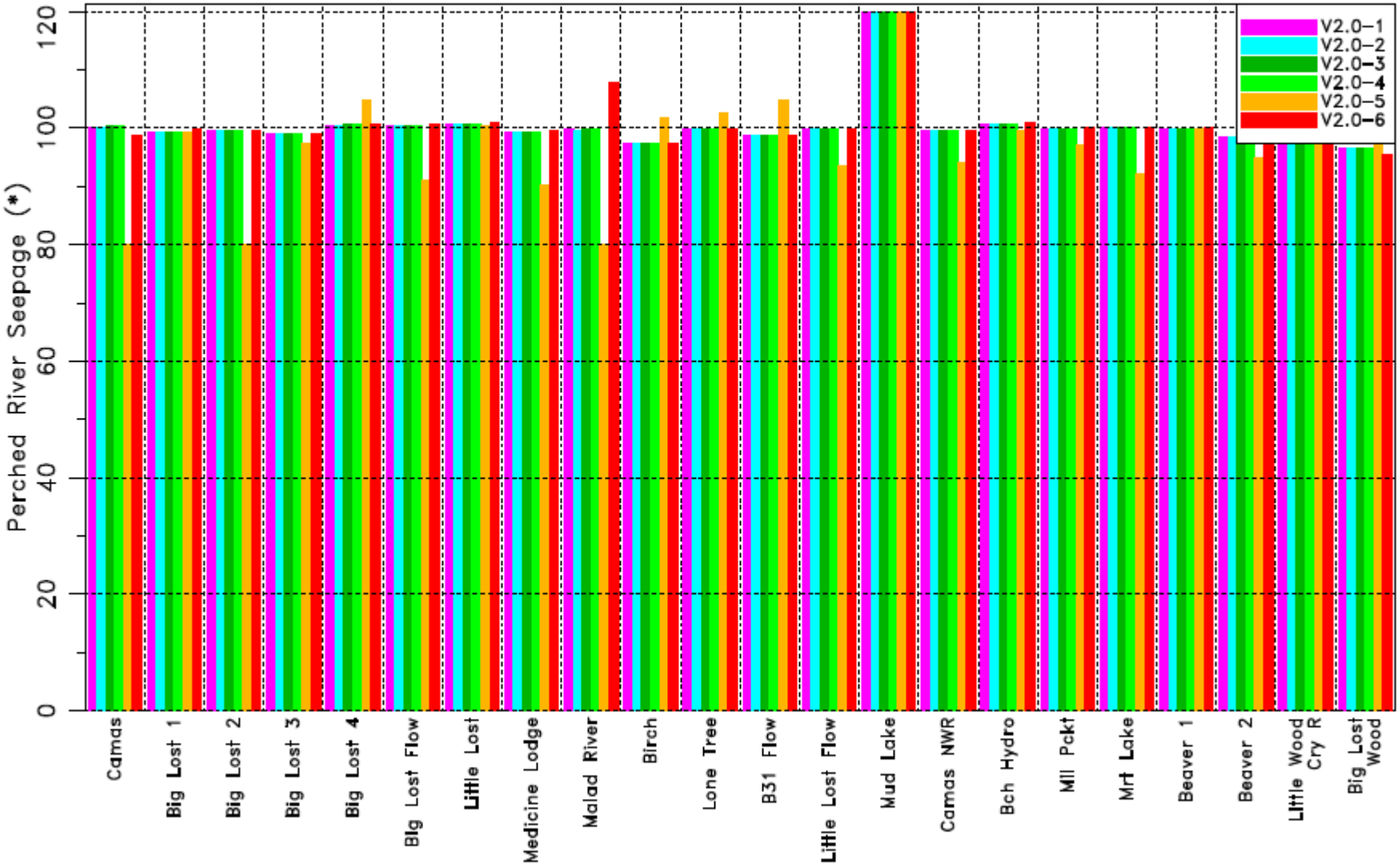
Underflow Conductance

Eastern Snake Plain Aquifer Model



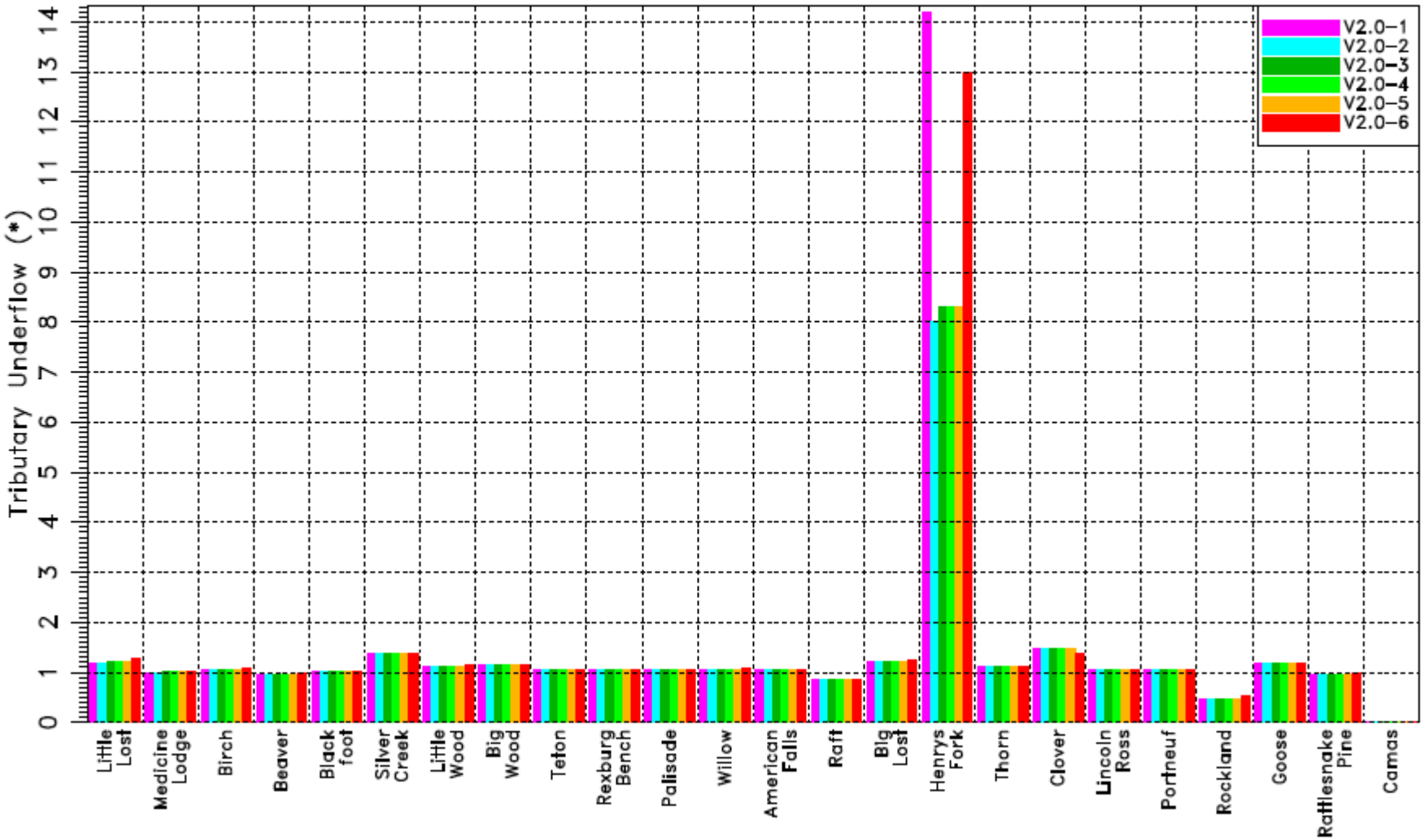
Perched River Seepage

Eastern Snake Plain Aquifer Model



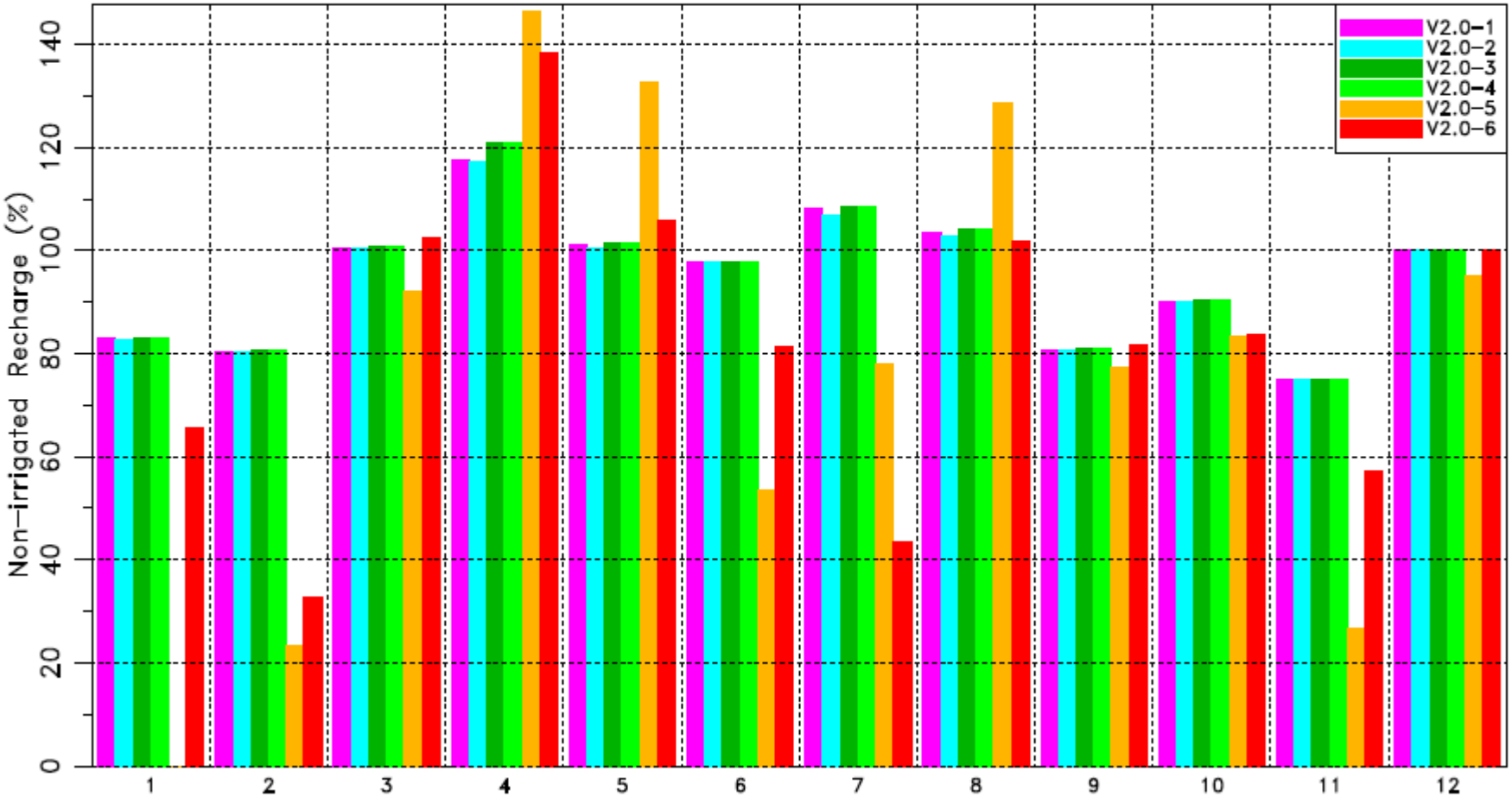
Tributary Underflow

Eastern Snake Plain Aquifer Model



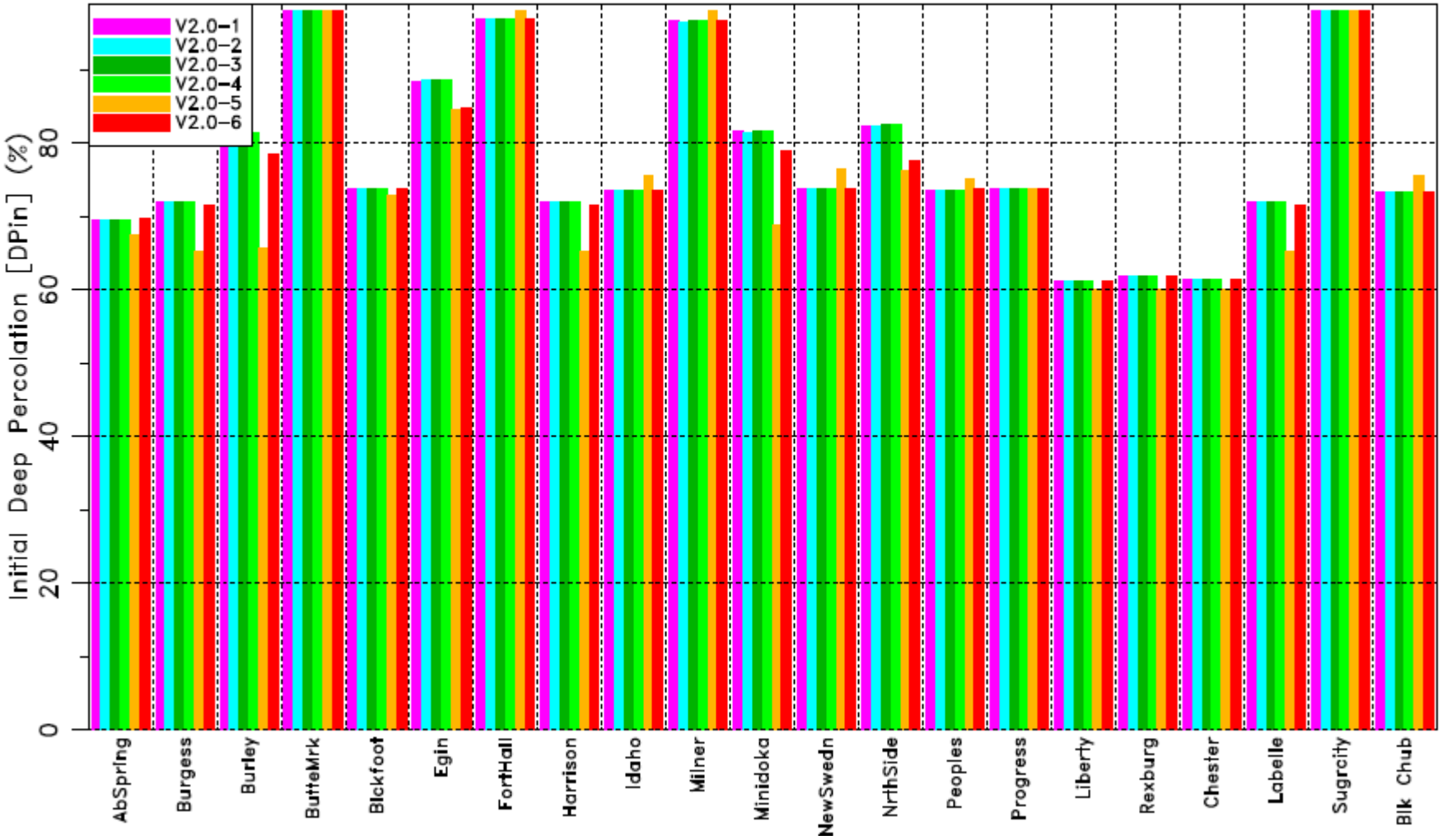
Non-irrigated Recharge

Eastern Snake Plain Aquifer Model



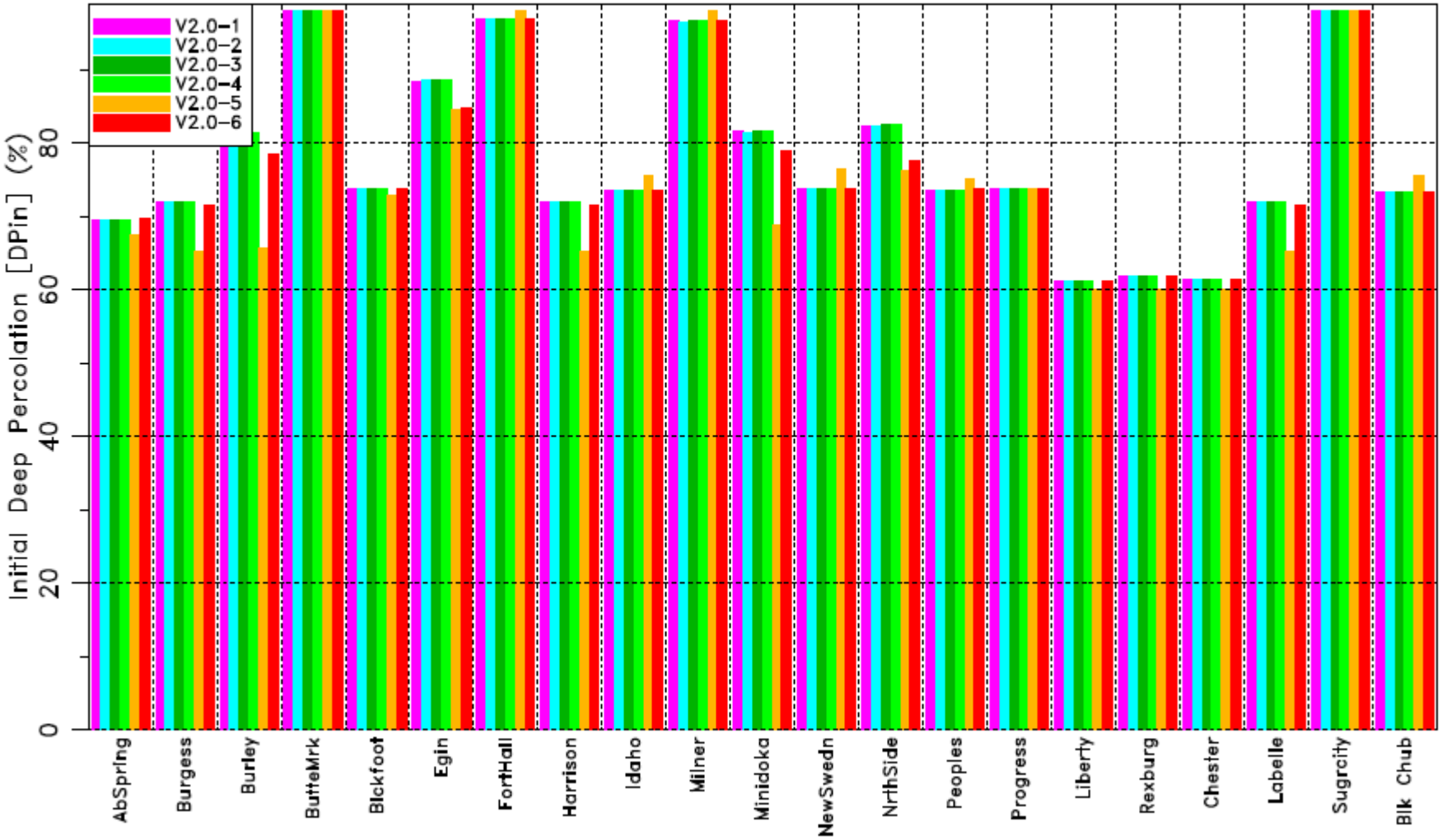
Initial Deep Percolation [DPin]

Eastern Snake Plain Aquifer Model



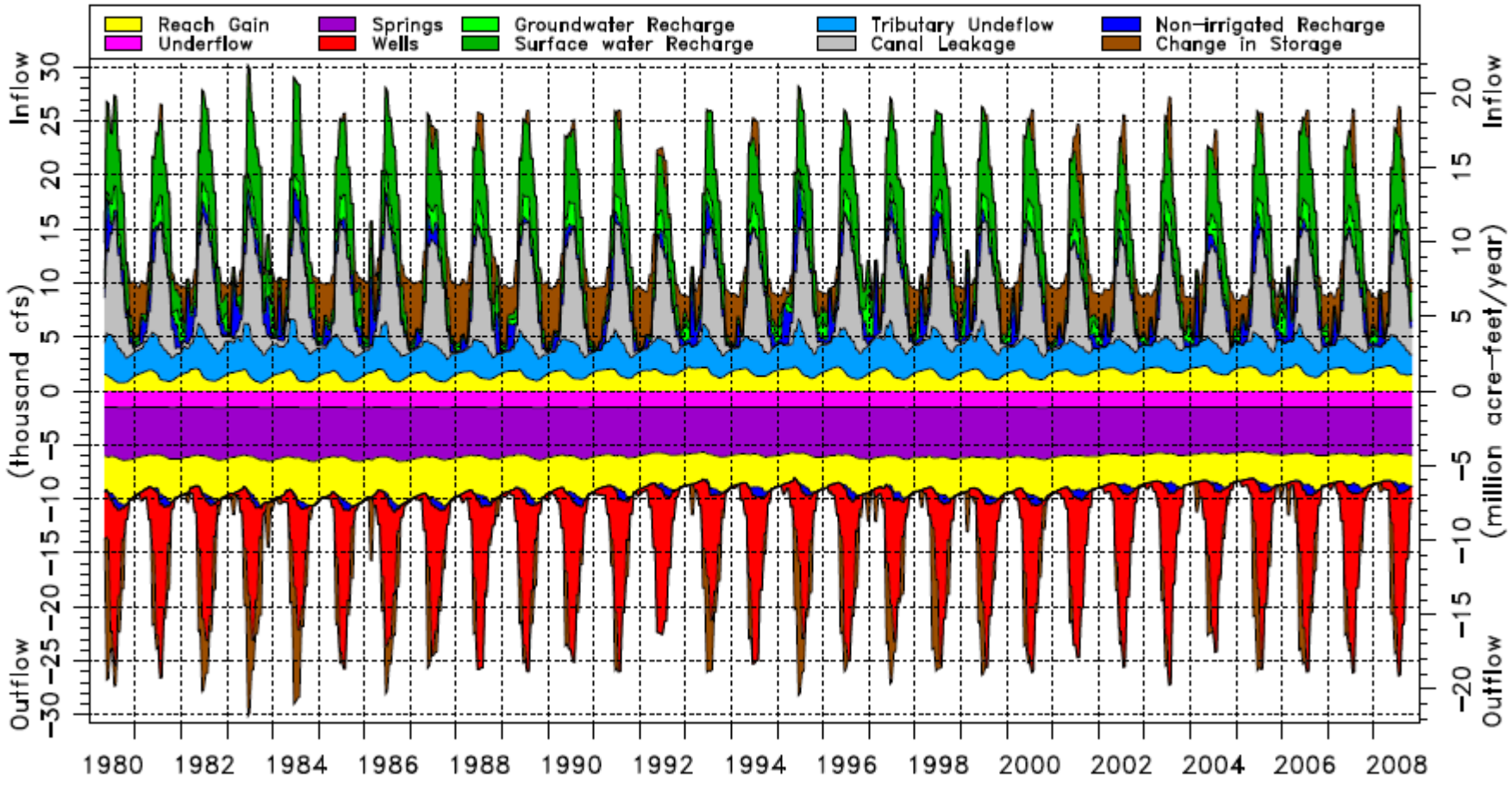
Initial Deep Percolation [DPin]

Eastern Snake Plain Aquifer Model



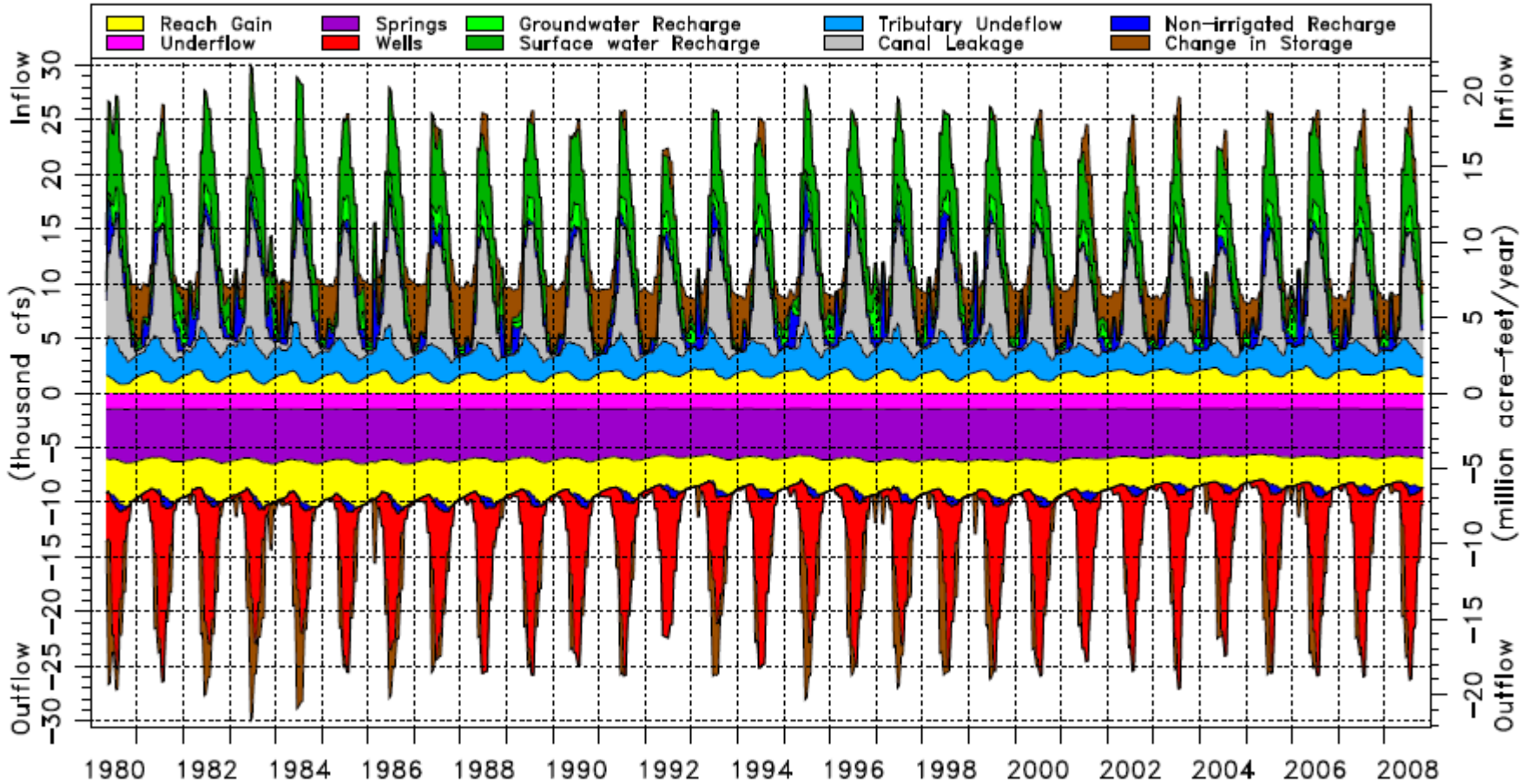
Water Budget V2.0–1

Eastern Snake Plain Aquifer Model



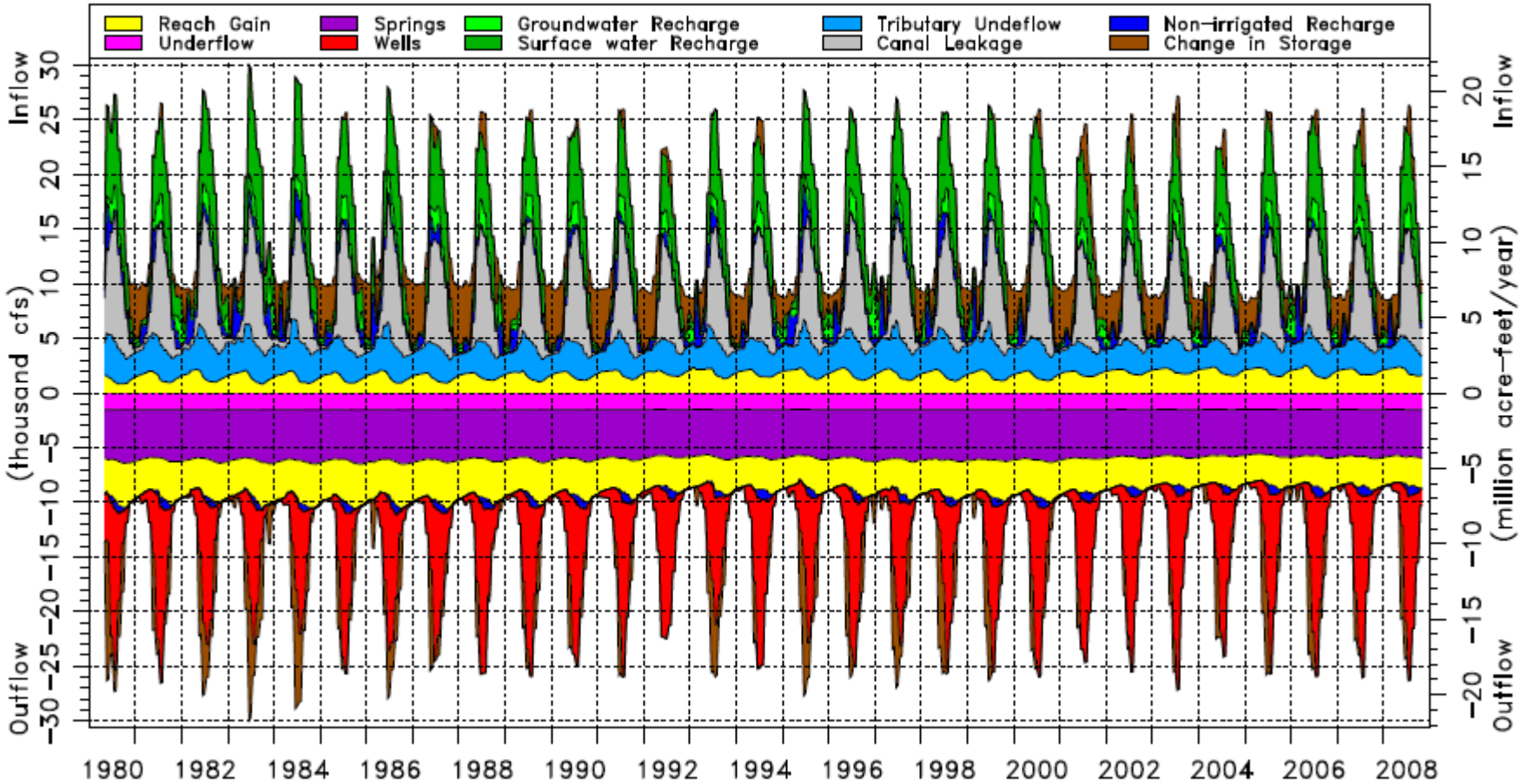
Water Budget V2.0–4

Eastern Snake Plain Aquifer Model



Water Budget V2.0–6

Eastern Snake Plain Aquifer Model



IDAHO Department of Water Resources

ESPAM Model Calibration Comparisons
PEST Observation Target Group Calibration Influence

Comparison of Observation Group Calibration Influence (% contribution to measured objective function)

Observation Group	E120116A001	E120116A002	E120116A003	E120116A004	E120116A005	E120116A006
uf_cry	0.00%	10.09%	18.89%	18.90%	19.31%	0.00%
spg_kimbul	8.72%	7.23%	6.85%	6.85%	6.95%	8.69%
spg_isfkh	8.40%	6.78%	6.39%	6.39%	6.58%	8.61%
spg_bullsf	8.43%	6.71%	6.10%	6.11%	6.32%	8.95%
spg_kimkh	7.73%	6.24%	5.84%	5.85%	5.92%	7.89%
ufn_m	6.03%	4.89%	4.58%	4.58%	4.69%	6.24%
seas	5.56%	4.56%	4.55%	4.55%	4.32%	4.99%
ufs_nb	5.79%	4.75%	4.40%	4.40%	4.48%	5.94%
uf_bhrt	0.01%	2.09%	3.79%	3.79%	3.81%	0.00%
ufa_r	4.86%	4.14%	3.73%	3.74%	3.79%	5.08%
ufh_s	4.23%	3.39%	3.16%	3.16%	3.22%	4.23%
tranhds	4.00%	7.27%	3.06%	3.04%	3.18%	3.40%
ufnb_n	3.79%	3.10%	2.87%	2.87%	2.90%	3.87%
scry	1.67%	3.21%	2.63%	2.66%	2.71%	1.53%
sndsp	3.09%	2.55%	2.24%	2.21%	2.30%	3.04%
sclk	2.55%	2.04%	2.16%	2.16%	1.89%	2.25%
sbrg	2.65%	2.10%	1.96%	1.97%	2.02%	2.20%
sblk	2.47%	2.23%	1.86%	1.86%	1.90%	2.51%
snlaq	1.76%	1.61%	1.78%	1.73%	1.72%	1.67%
sdc	1.96%	1.77%	1.65%	1.65%	1.61%	2.06%
sdwb	1.64%	1.38%	1.27%	1.28%	1.32%	1.67%
sbox	1.86%	1.07%	1.12%	1.11%	0.89%	4.02%
smld	1.60%	1.33%	1.12%	1.13%	1.16%	1.65%
sksp	1.46%	1.28%	1.12%	1.11%	1.11%	1.31%
srang	1.22%	0.99%	0.92%	0.92%	0.80%	1.22%
snfh	1.16%	0.98%	0.90%	0.91%	0.81%	1.17%
nsc_ret	1.04%	0.84%	0.81%	0.81%	0.57%	0.76%
btmklk_ret	0.86%	0.70%	0.66%	0.66%	0.63%	0.89%
bld_ret	0.77%	0.62%	0.58%	0.58%	0.31%	0.63%
mld_ret	0.75%	0.61%	0.57%	0.57%	0.42%	0.63%
s3sp	1.10%	0.85%	0.56%	0.56%	0.58%	0.80%
lbrty_ret	0.72%	0.58%	0.54%	0.55%	0.50%	0.74%
gfdr_ret	0.63%	0.51%	0.48%	0.48%	0.46%	0.63%
eqln_ret	0.61%	0.49%	0.46%	0.46%	0.42%	0.57%
bullsf_rat	0.45%	0.53%	0.14%	0.13%	0.16%	0.00%
absp_ret	0.13%	0.11%	0.10%	0.10%	0.09%	0.13%
uf_isfkh	0.02%	0.06%	0.09%	0.09%	0.09%	0.00%
uf_kimbul	0.05%	0.13%	0.03%	0.03%	0.03%	0.02%
isfkh_rat	0.19%	0.12%	0.02%	0.02%	0.02%	0.00%
kimbul_rat	0.01%	0.06%	0.01%	0.01%	0.01%	0.00%
uf_bullsf	0.00%	0.01%	0.01%	0.02%	0.00%	0.00%
uf_ksp	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

	E120116A001	E120116A002	E120116A003	E120116A004	E120116A005	E120116A006
Total Measurement Objective Function	27,877	34,436	36,742	36,720	35,898	26,975
Adjustable Spring Elevation Parameter?	No	Yes	Yes	Yes	Yes	No

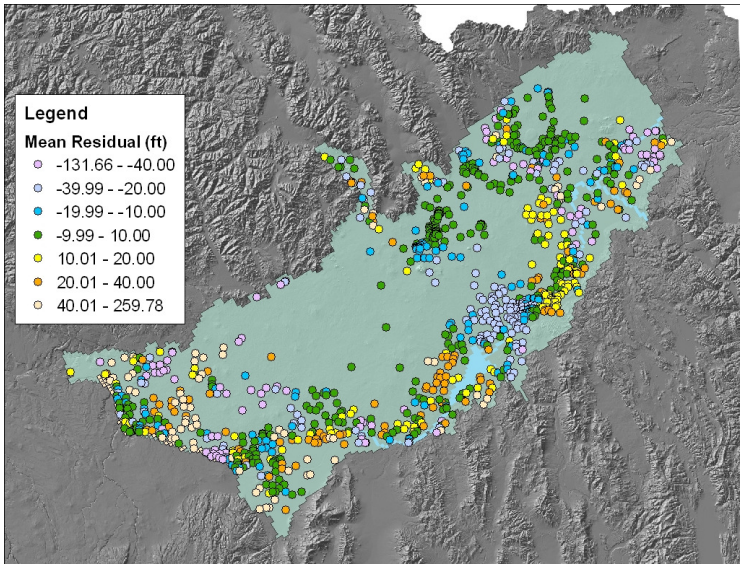
Comparison of Observation Group Calibration Influence (weighted residual)

Observation Group	E120116A001	E120116A002	E120116A003	E120116A004	E120116A005	E120116A006
uf_cry	0	3,476	6,941	6,941	6,932	0
spg_kimbul	2,430	2,489	2,517	2,516	2,496	2,343
spg_isfkh	2,343	2,335	2,346	2,346	2,362	2,323
spg_bullsf	2,351	2,310	2,243	2,245	2,268	2,413
spg_kimkh	2,155	2,150	2,147	2,147	2,126	2,128
ufn_m	1,681	1,684	1,682	1,682	1,682	1,684
seas	1,550	1,571	1,672	1,670	1,550	1,346
ufs_nb	1,615	1,635	1,616	1,616	1,607	1,603
uf_bhrt	4	720	1,393	1,392	1,369	0
ufa_r	1,361	1,424	1,372	1,372	1,362	1,371
ufh_s	1,178	1,169	1,162	1,161	1,157	1,142
tranhds	1,116	2,505	1,123	1,118	1,142	918
ufnb_n	1,056	1,068	1,053	1,053	1,040	1,044
scry	466	1,104	965	978	972	412
sndsp	861	877	824	813	826	819
sclk	710	702	794	795	679	607
sbrg	738	724	720	723	725	593
sblk	690	769	682	682	681	678
snlaq	492	555	654	637	618	452
sdc	546	610	607	607	578	556
sdwb	459	476	468	471	475	452
sbox	518	368	413	406	320	1,085
smld	446	457	411	413	416	445
sksp	406	441	410	408	398	354
srang	341	340	339	339	287	328
snfh	324	338	331	334	292	315
nsc_ret	289	290	297	297	206	205
btmklk_ret	241	241	241	241	228	241
bld_ret	215	214	215	215	111	169
mld_ret	210	210	210	210	151	170
s3sp	308	293	205	205	209	215
lbrty_ret	200	200	200	200	179	201
gfdr_ret	175	175	176	176	165	170
eqln_ret	170	169	168	168	149	153
bullsf_rat	125	184	50	46	58	0
absp_ret	37	37	37	37	32	36
uf_isfkh	6	21	35	32	32	0
uf_kimbul	13	43	12	12	11	5
isfkh_rat	52	40	8	8	7	0
kimbul_rat	3	20	3	3	4	0
uf_bullsf	0	2	3	7	0	0
uf_ksp	0	0	0	0	0	0

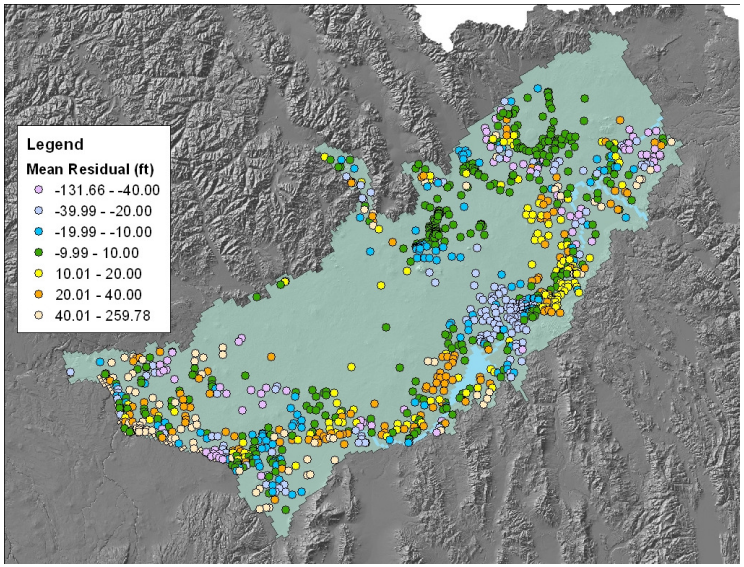
Delta Weighted Residual (Blue > 100, Red < -100)

A002-A001	A003-A001	A005-A001	A006-A001
3,475	6,941	6,932	0
59	87	66	-87
-8	3	19	-20
-41	-108	-83	62
-5	-8	-29	-27
3	1	1	3
21	122	0	-204
20	1	-8	-12
716	1,389	1,365	-4
63	11	1	10
-10	-16	-21	-36
1,389	7	26	-198
12	-3	-16	-12
638	499	507	-53
16	-37	-35	-42
-8	85	-31	-103
-14	-18	-13	-145
80	-8	-8	-12
63	162	126	-40
64	61	32	10
17	9	17	-7
-150	-105	-198	567
11	-36	-30	-1
36	4	-8	-52
-2	-2	-54	-13
15	7	-32	-9
1	8	-83	-84
0	0	-13	0
0	0	-104	-46
0	-1	-59	-41
-14	-103	-99	-93
0	0	-21	0
0	1	-10	-6
-1	-1	-20	-16
59	-75	-67	-124
0	0	-4	-1
15	29	26	-6
31	0	-2	-8
-12	-44	-45	-52
17	0	0	-3
2	3	0	0
0	0	0	0

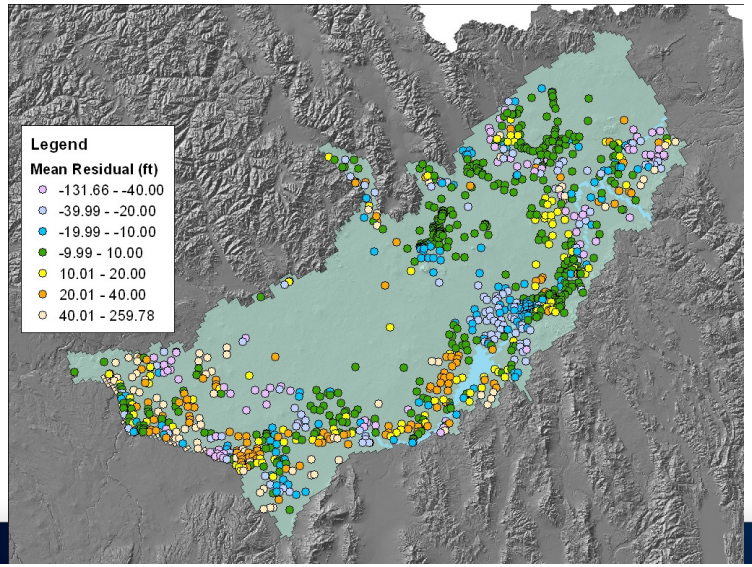
001



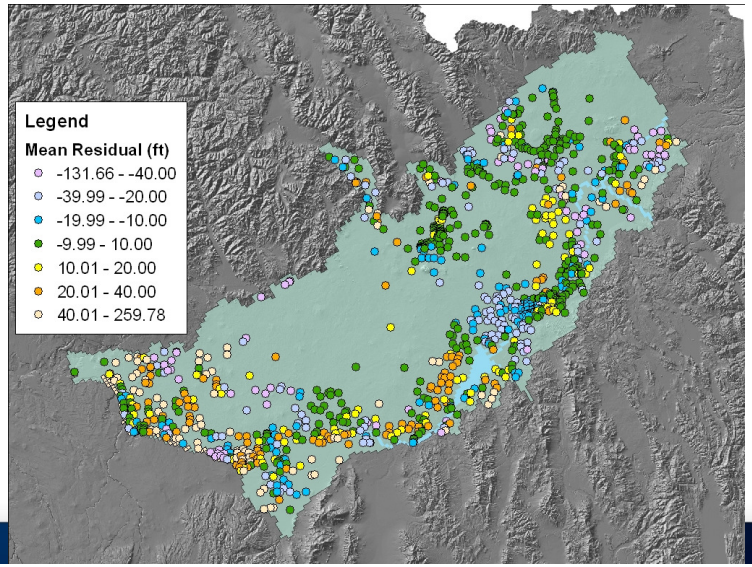
004



006

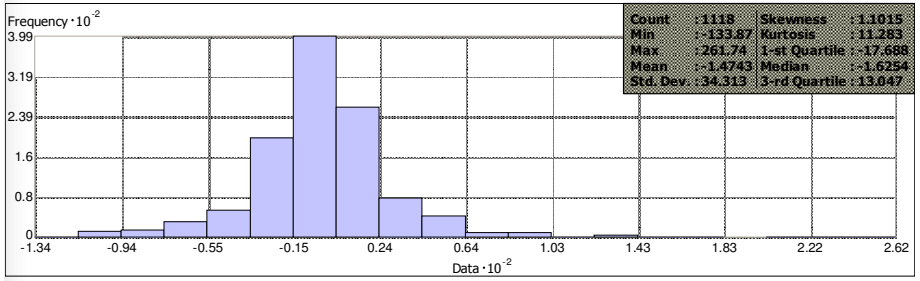


007



001

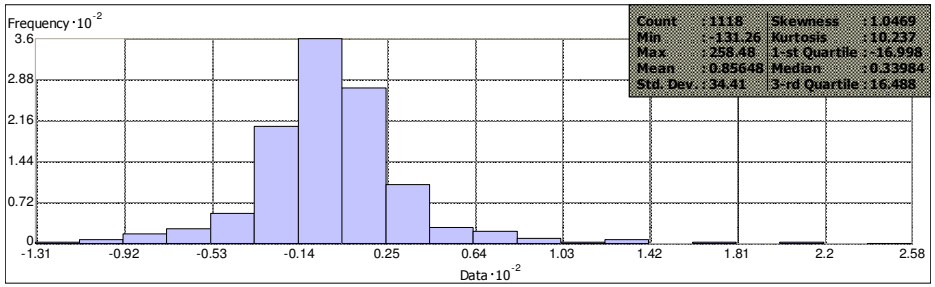
Histogram
Transformation: None



Data Source: TranHds Attribute: Mean

004

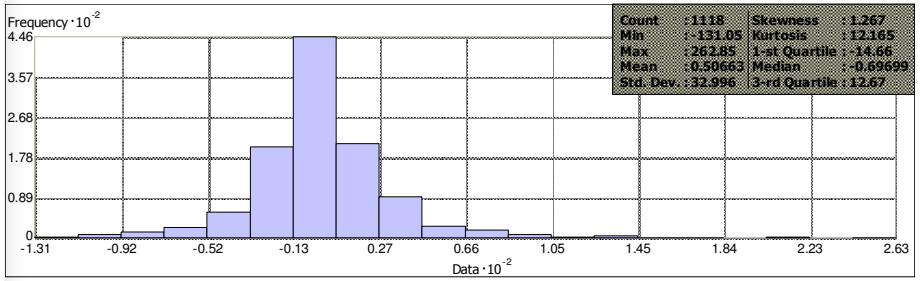
Histogram
Transformation: None



Data Source: Wells Attribute: Mean

006

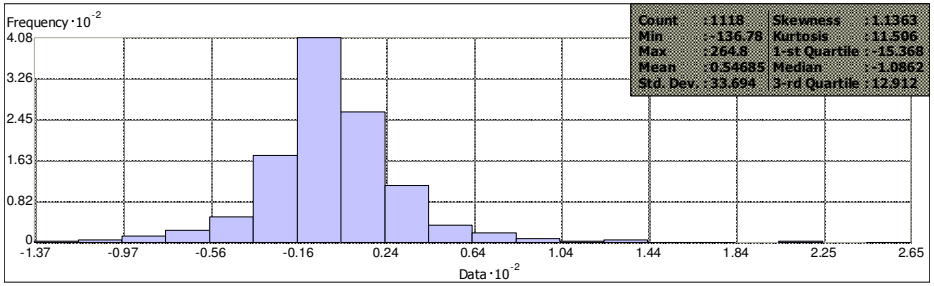
Histogram
Transformation: None



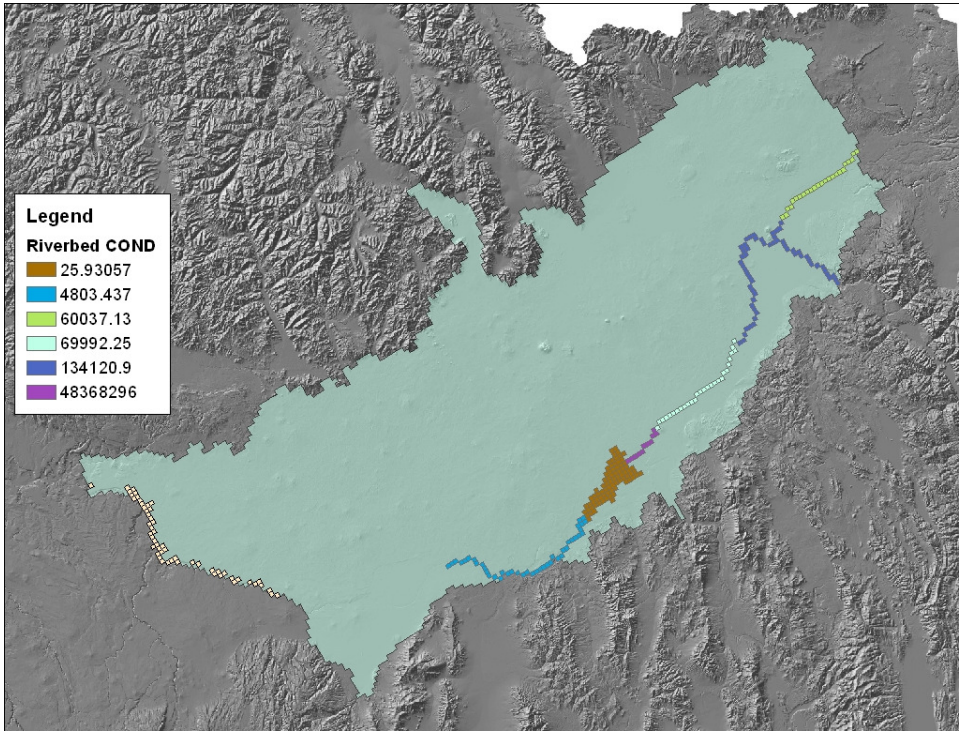
Data Source: Wells Attribute: Mean

007

Histogram
Transformation: None

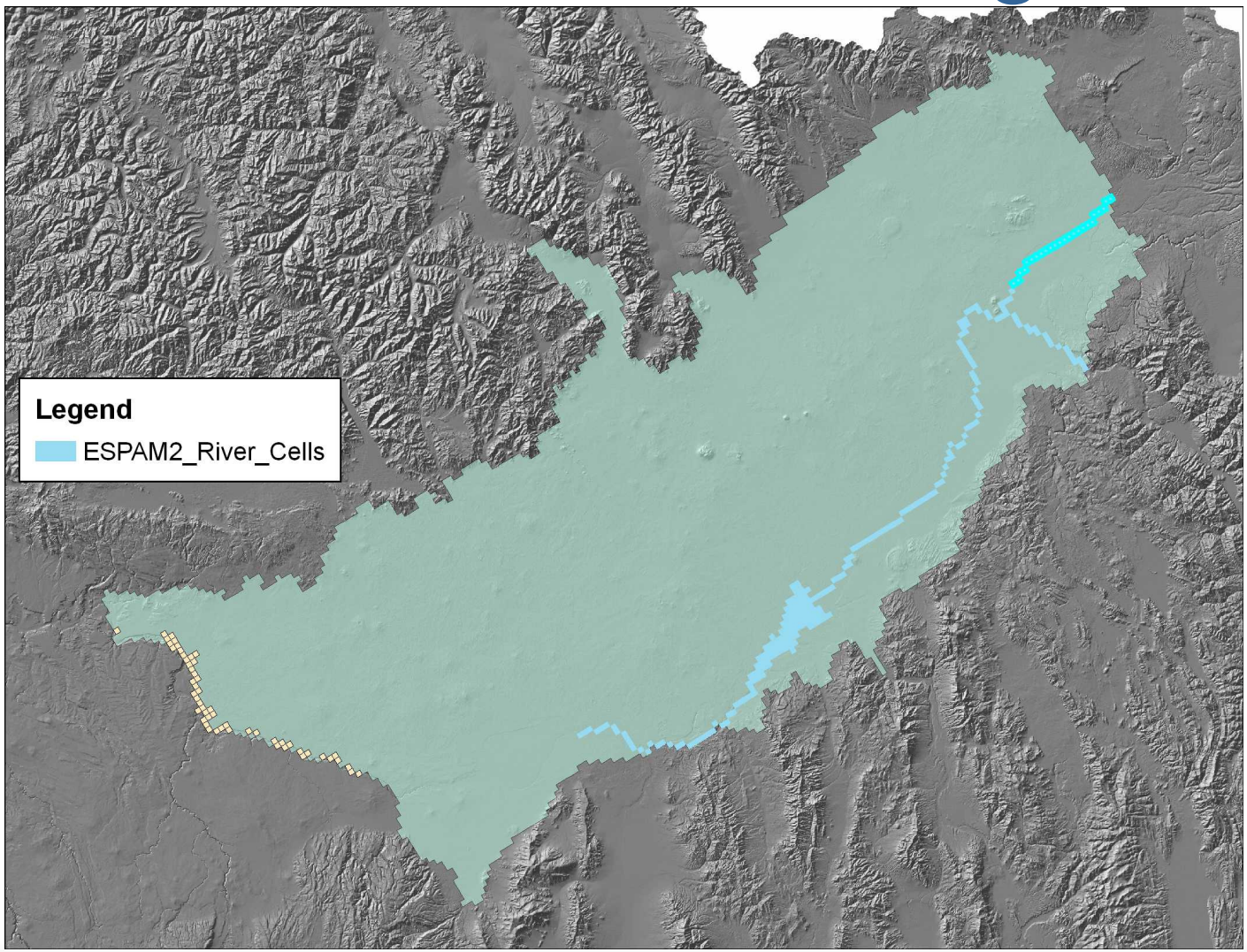


Data Source: Wells Attribute: Mean

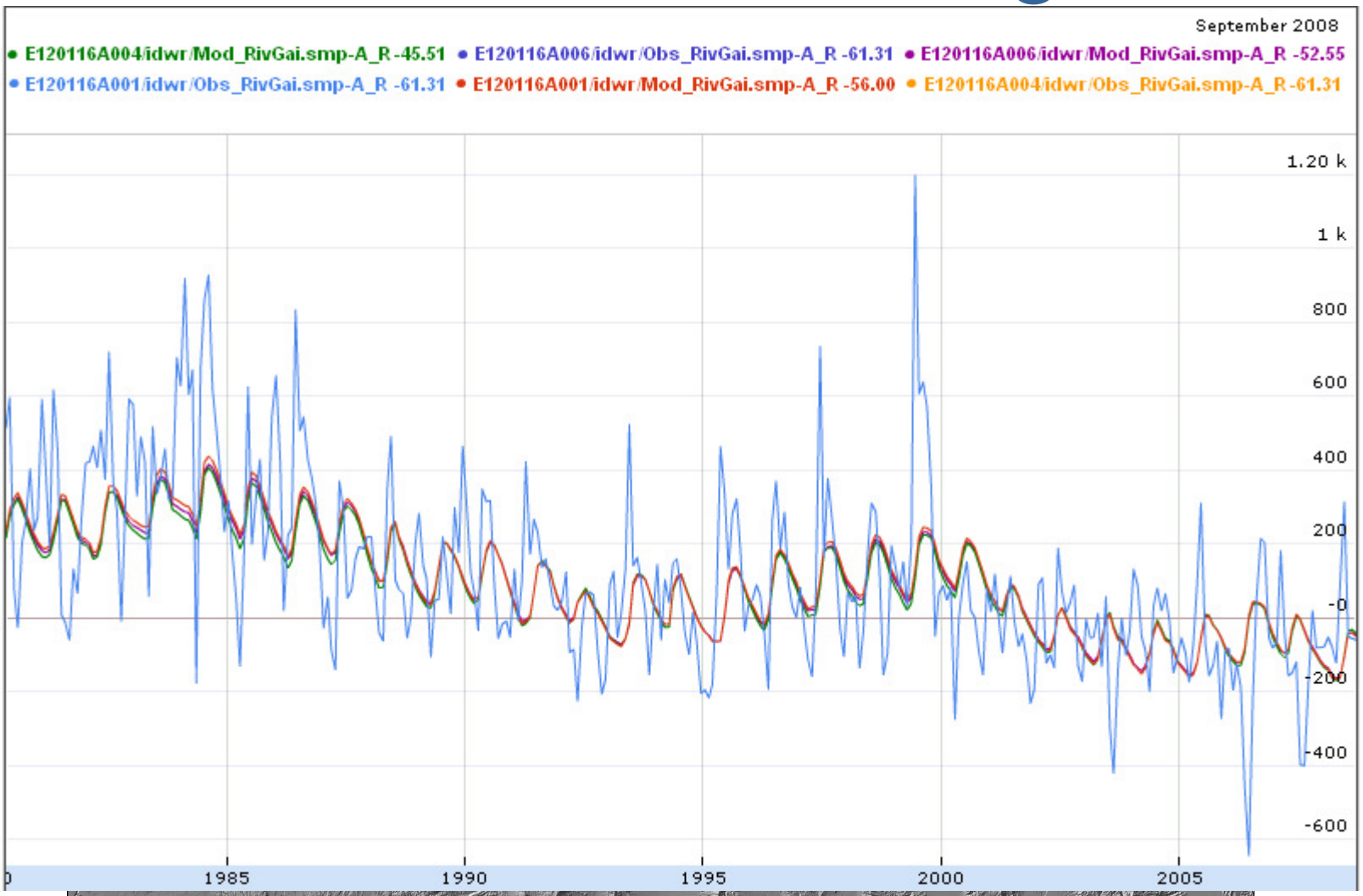


- Snake River reaches

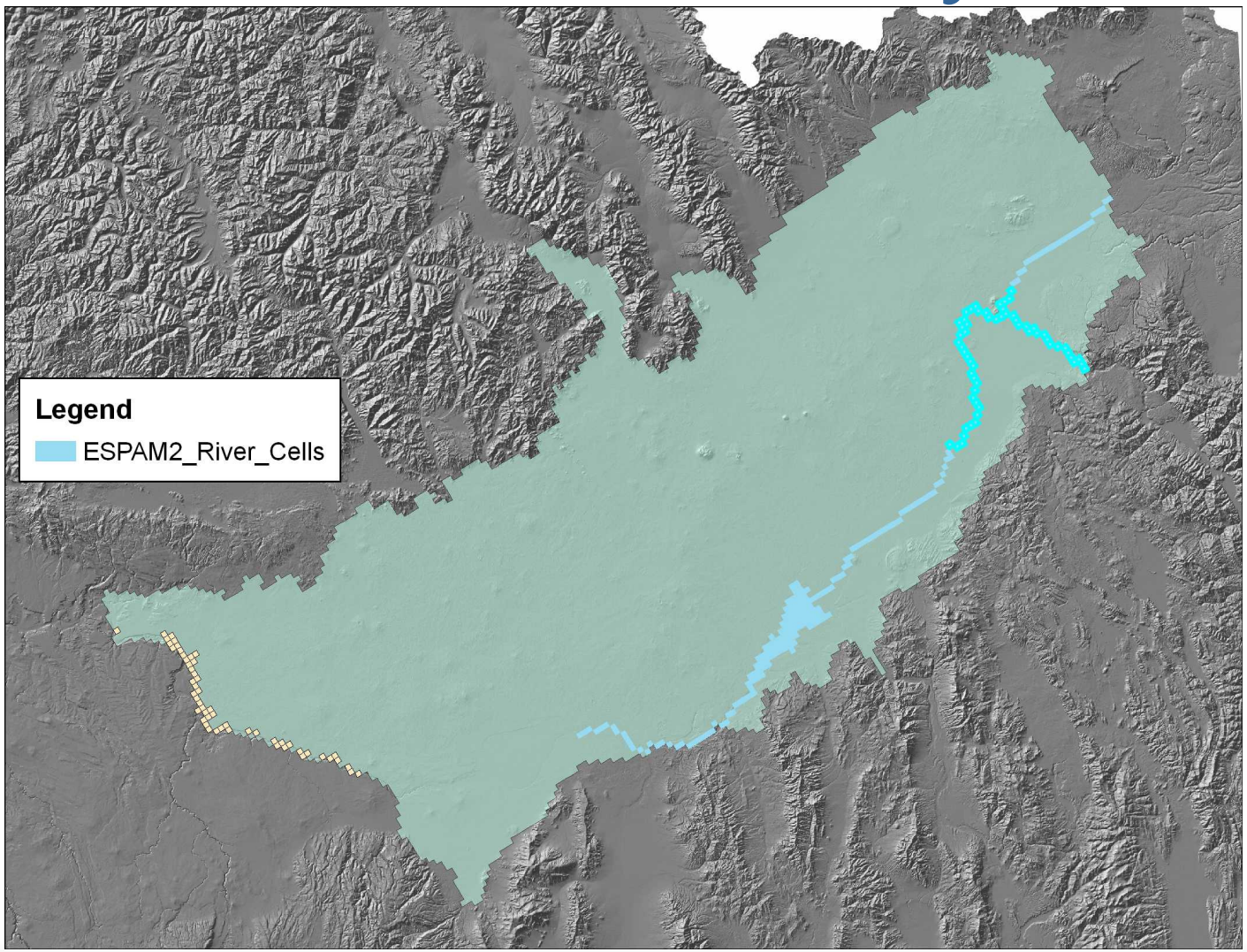
Ashton - Rexburg



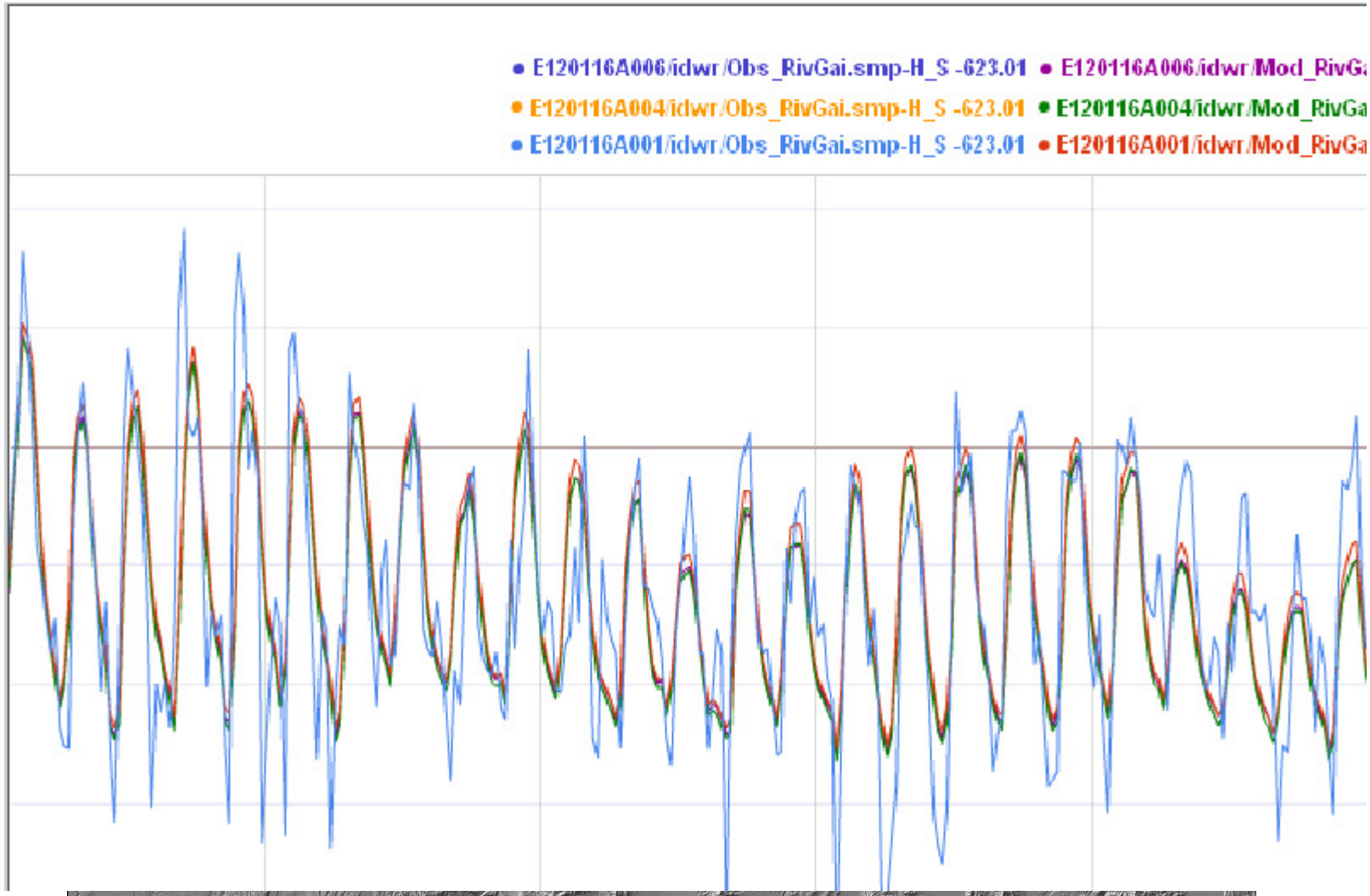
Ashton - Rexburg



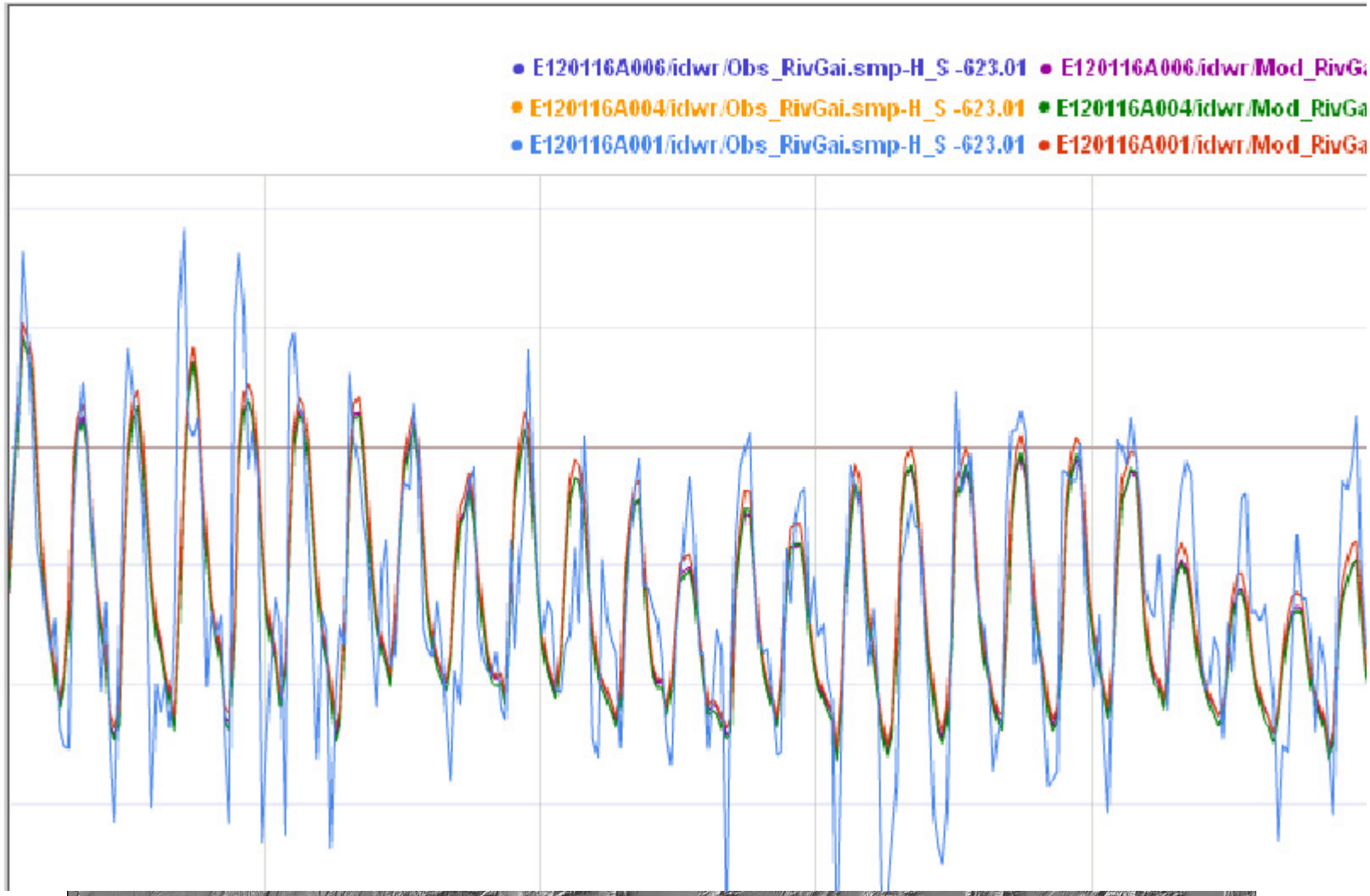
Heise - Shelley



Heise - Shelley

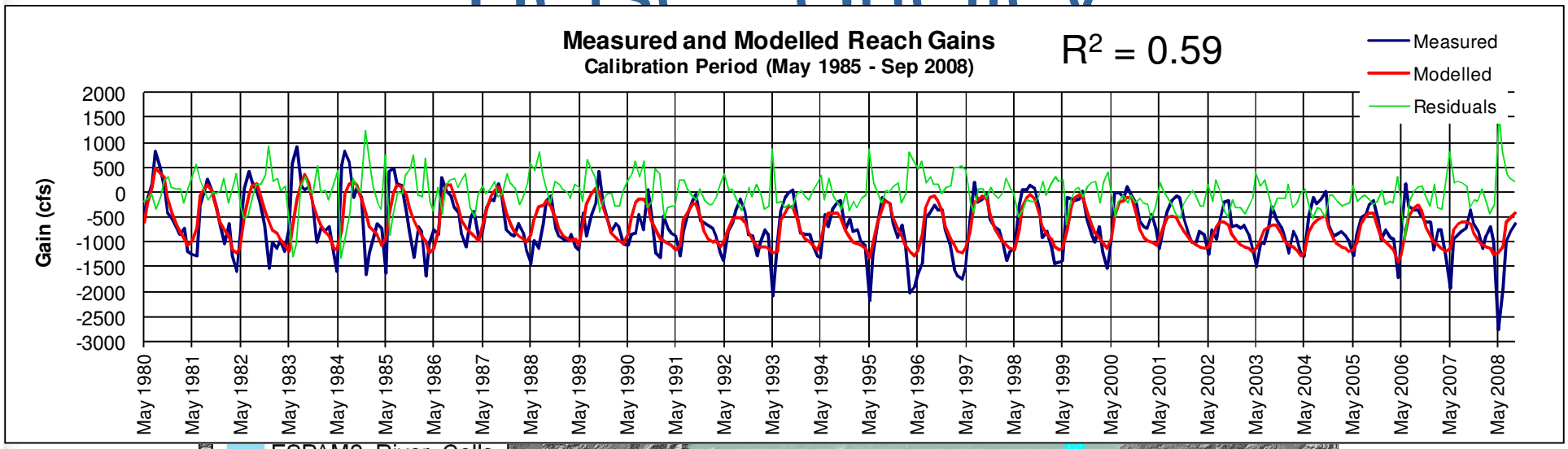


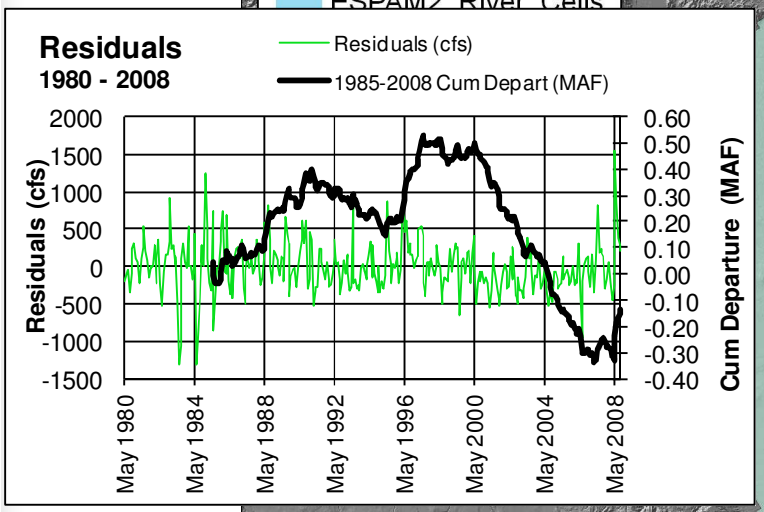
Heise - Shelley

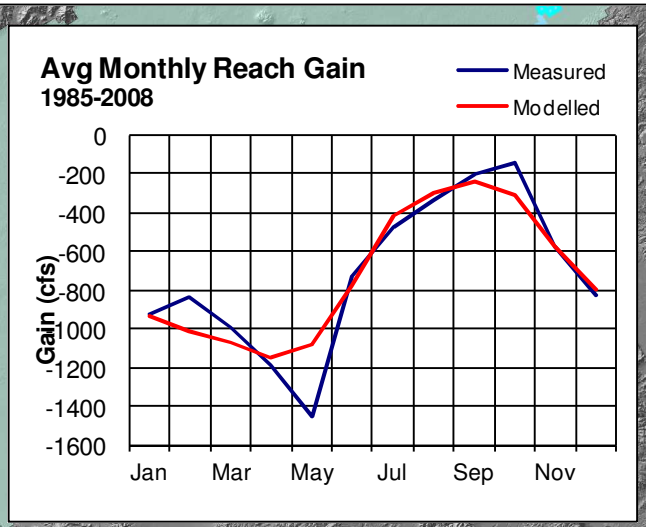


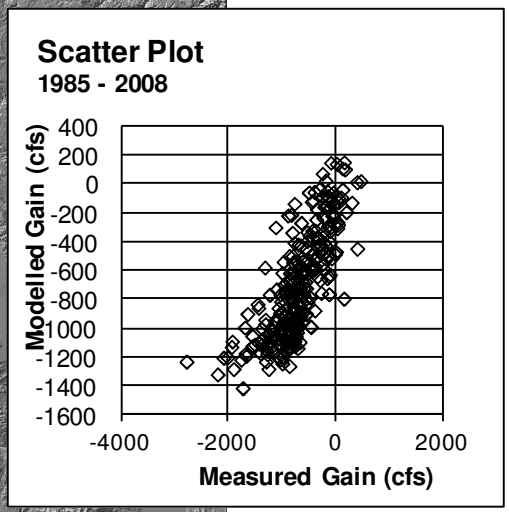
IDAHO Department of Water Resources

Heise - Shelley

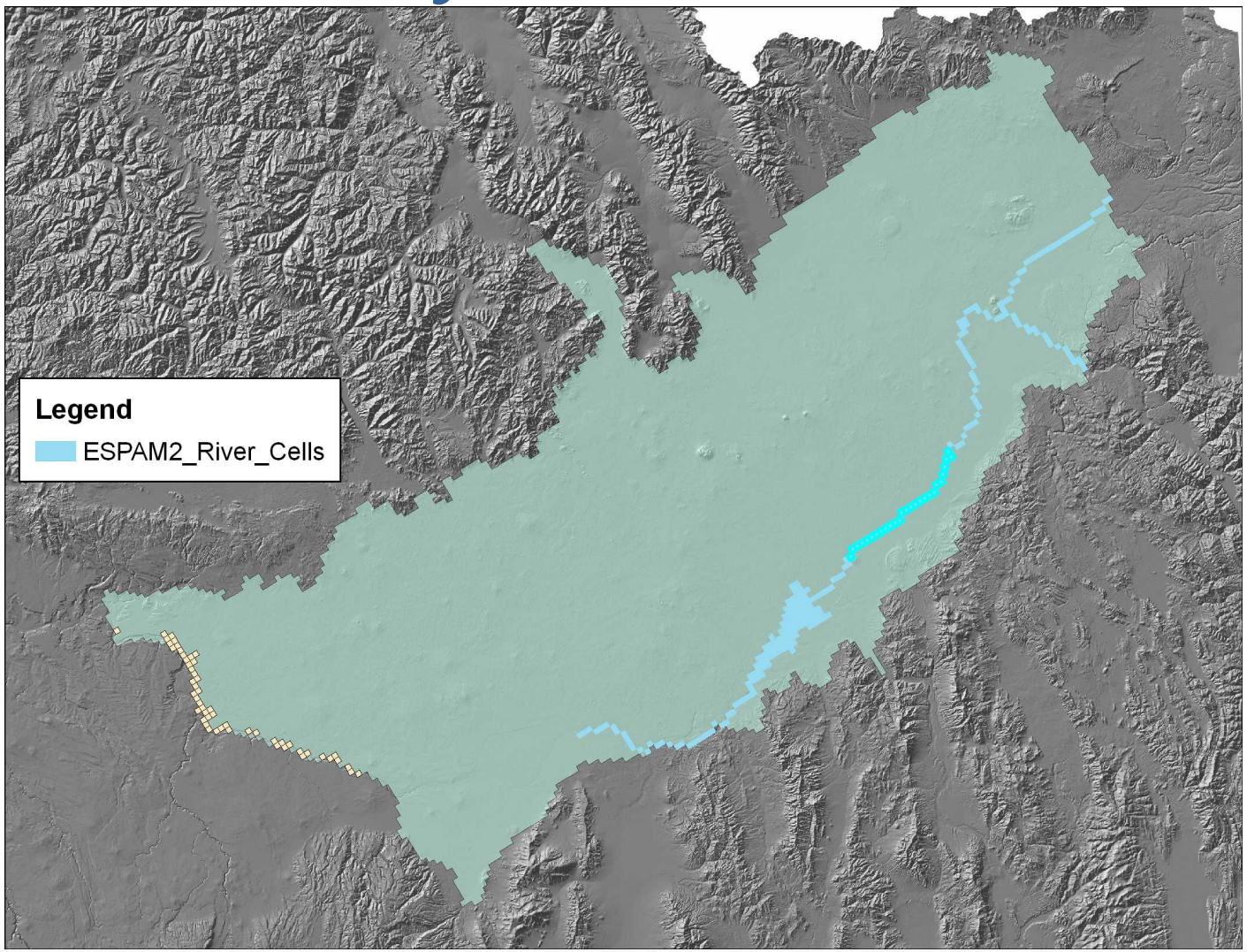




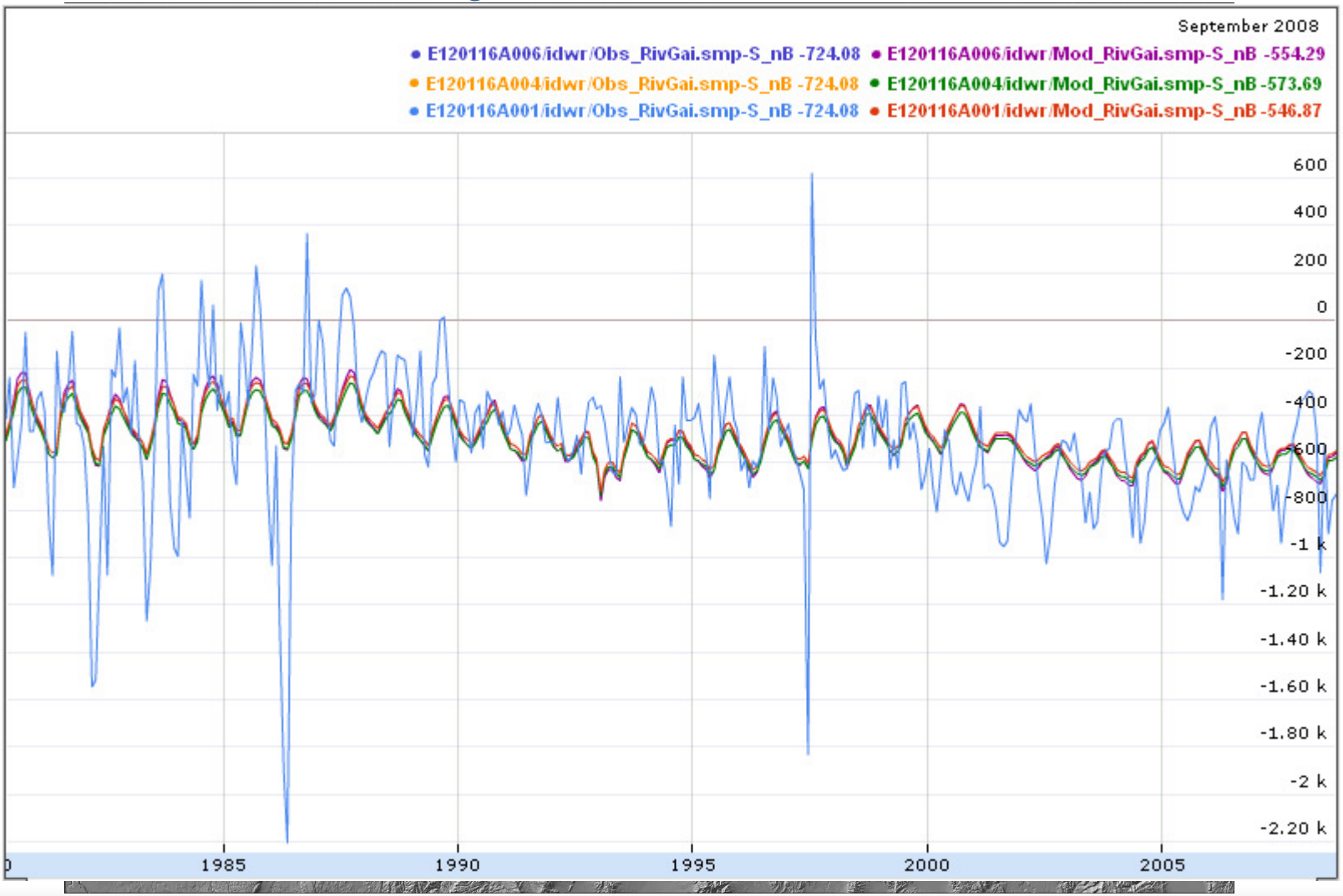




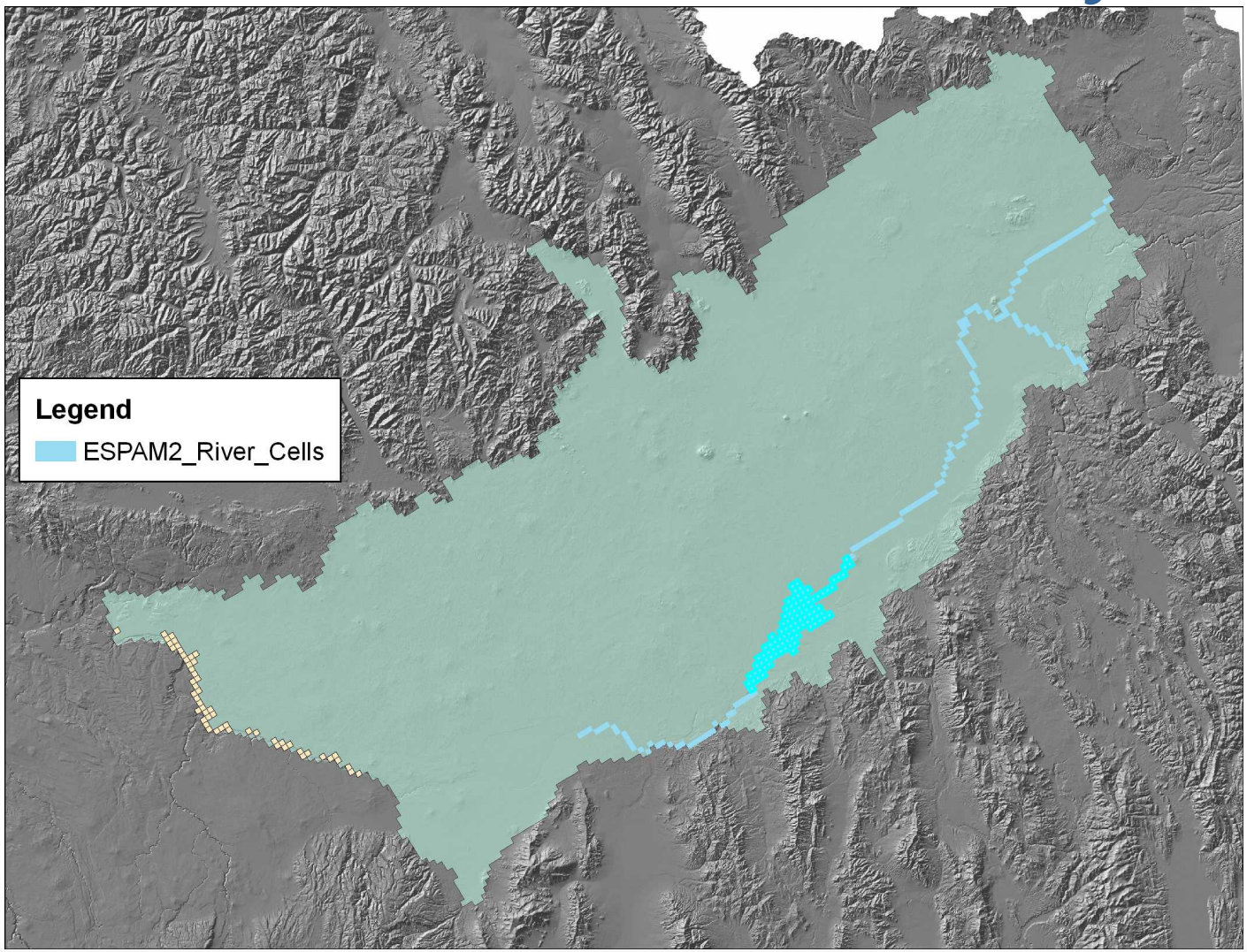
Shelley – nr Blackfoot



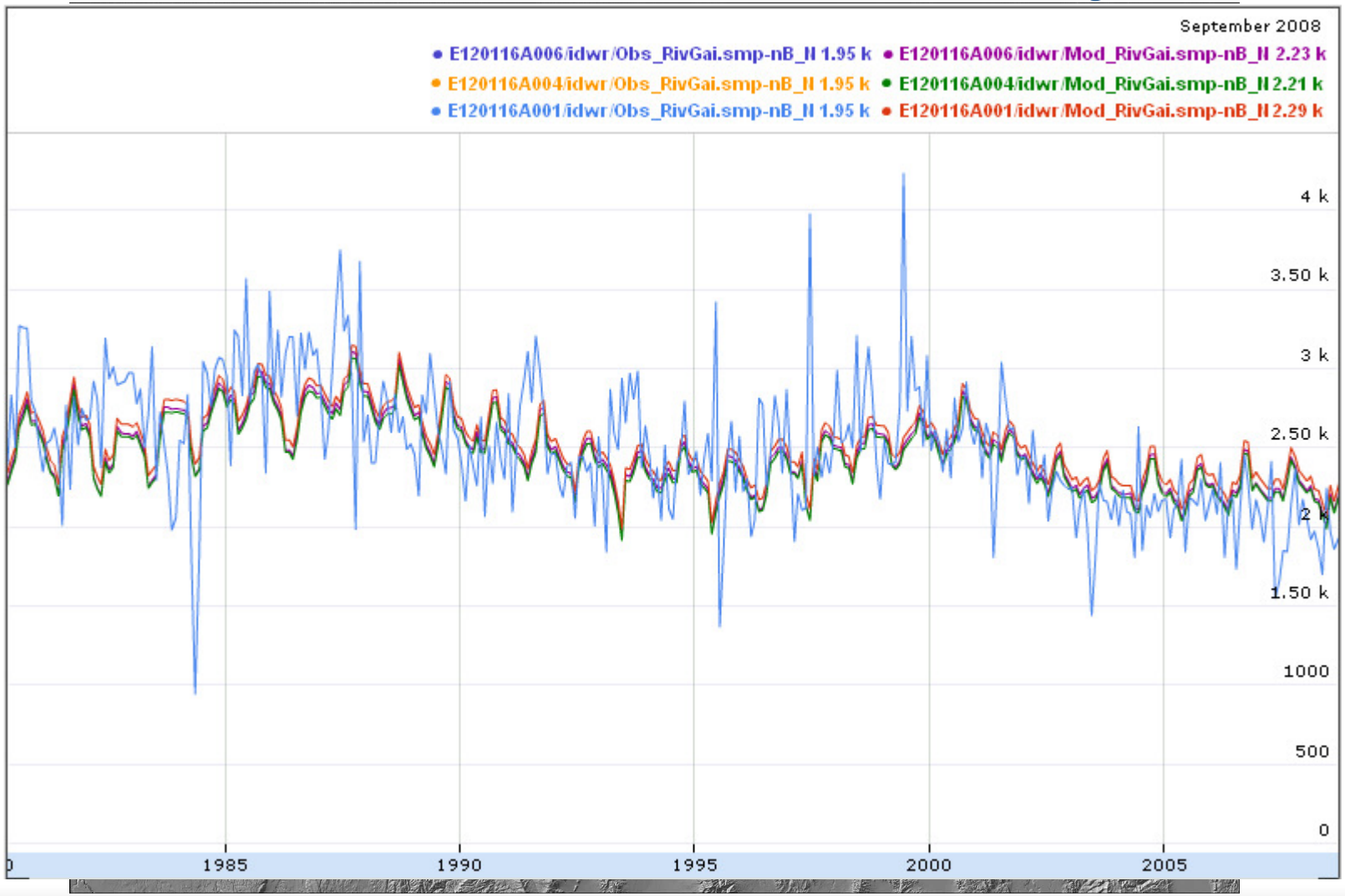
Shelley – nr Blackfoot



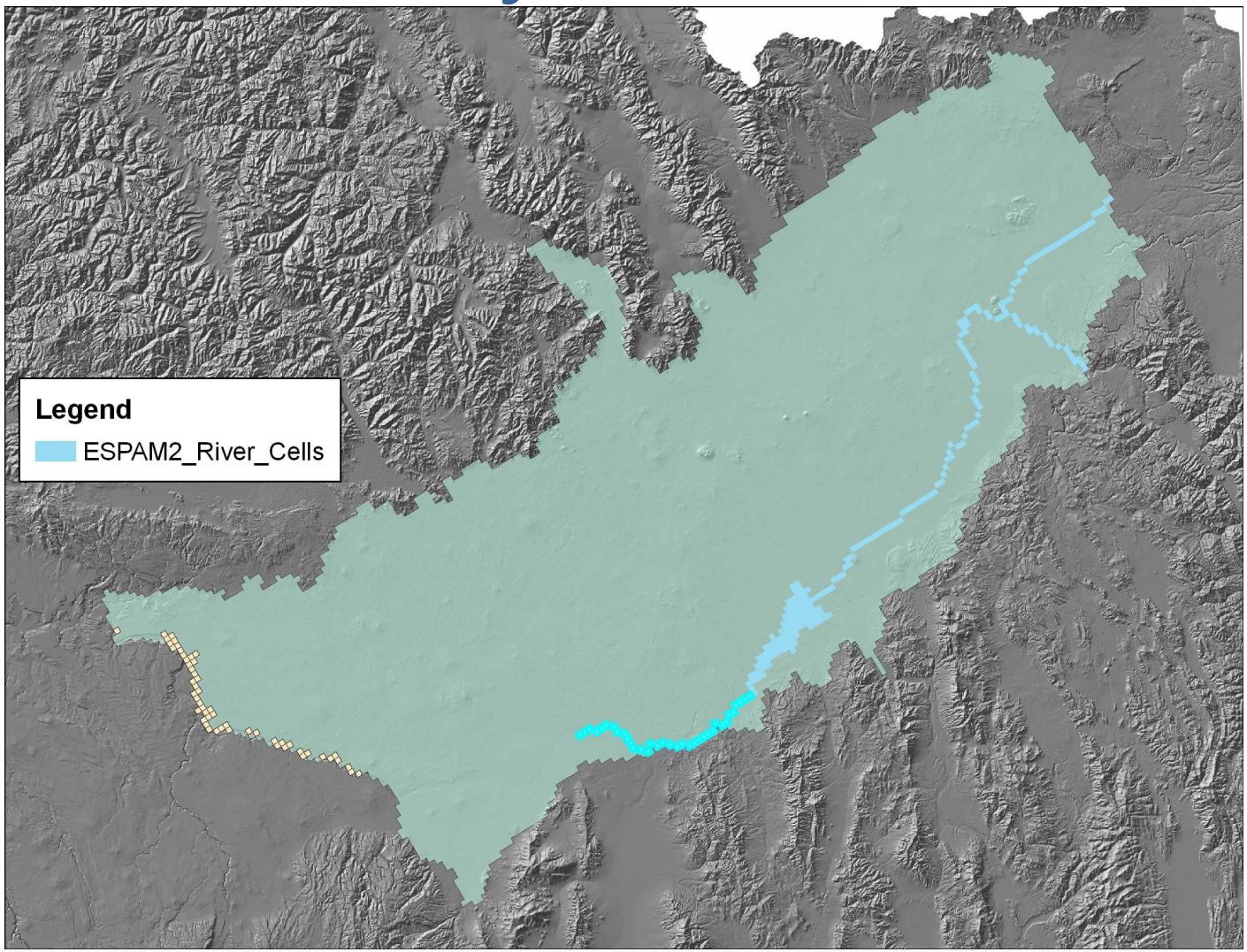
Nr Blackfoot - Neeley



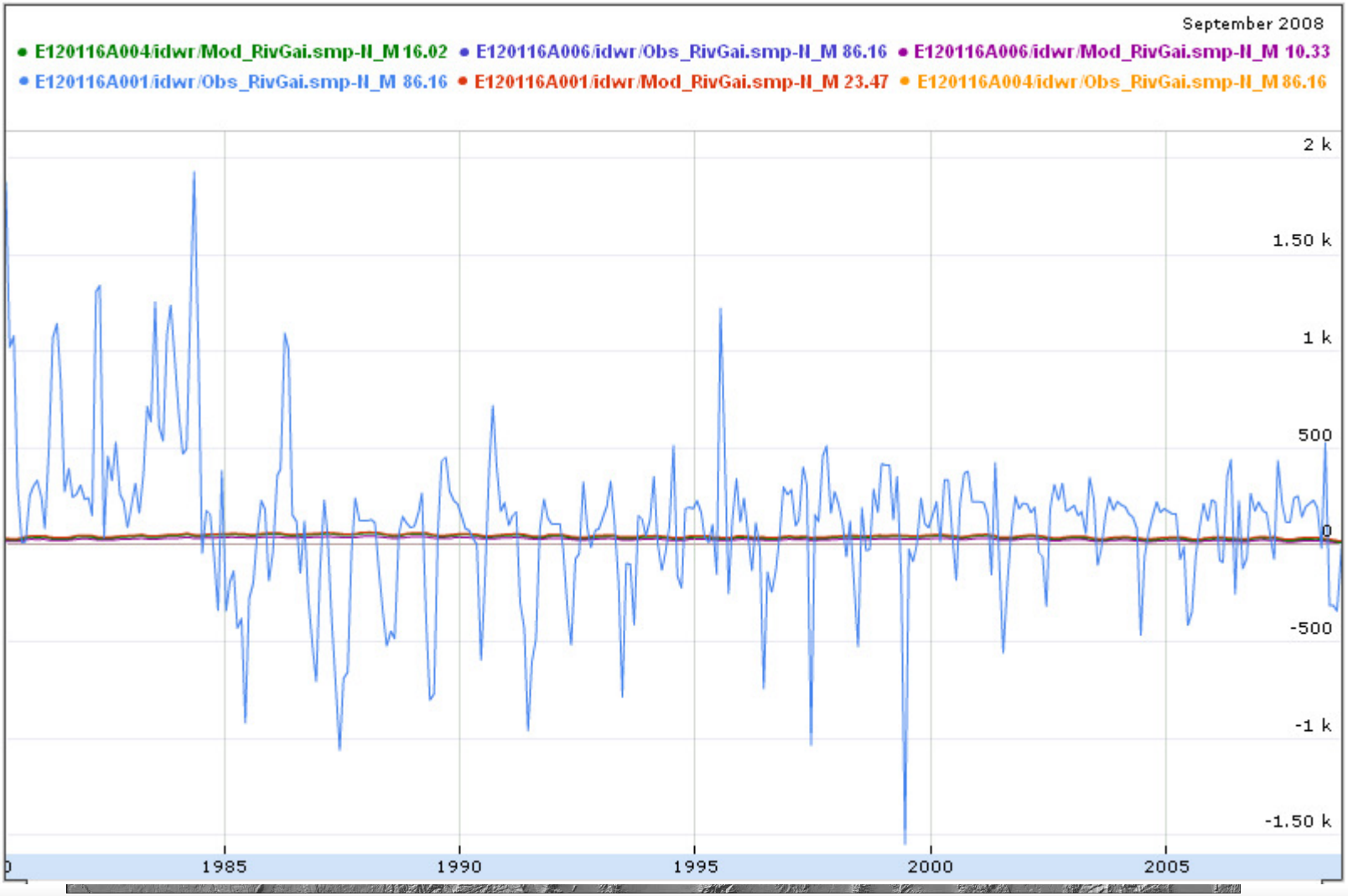
Nr Blackfoot - Neeley



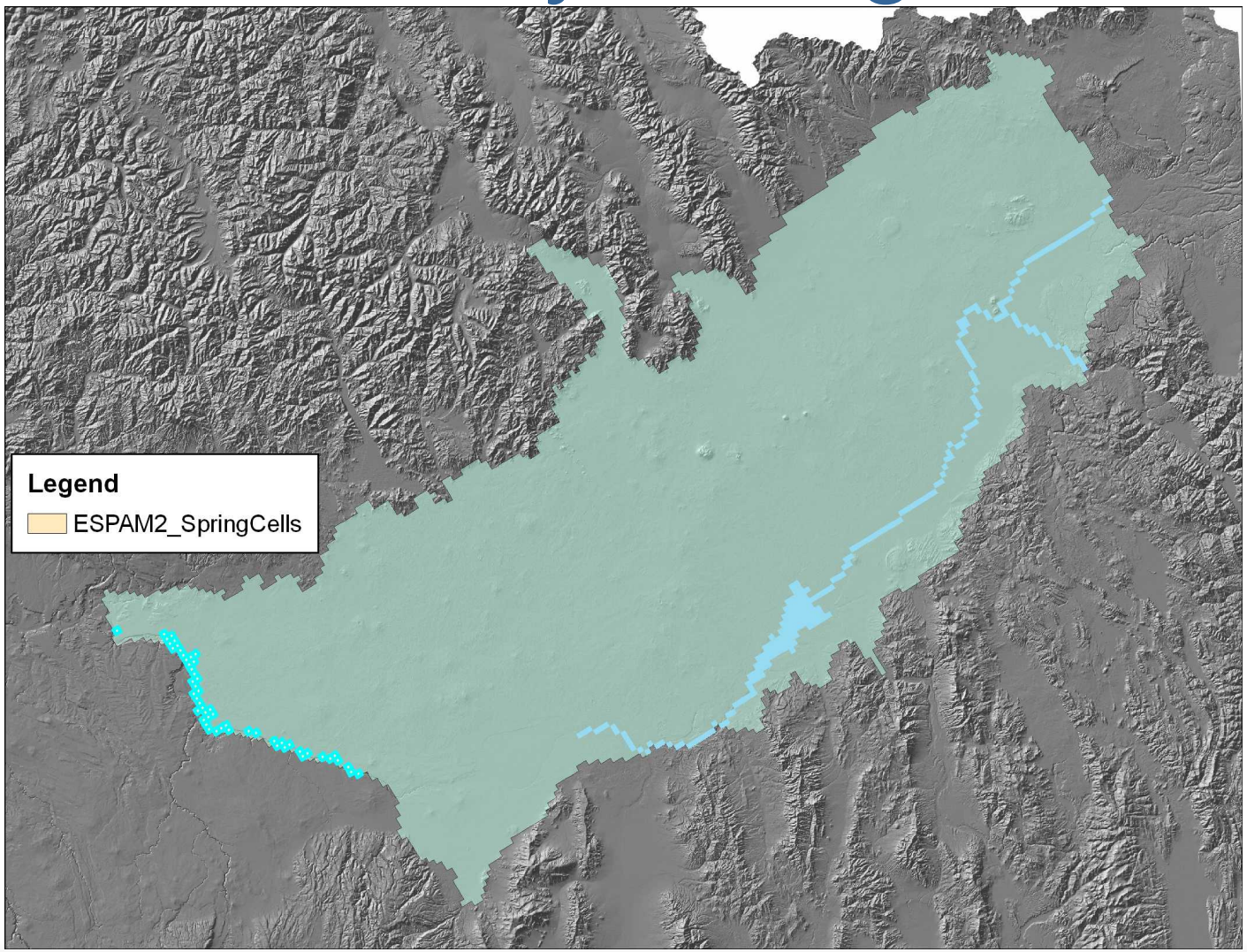
Neeley - Minidoka



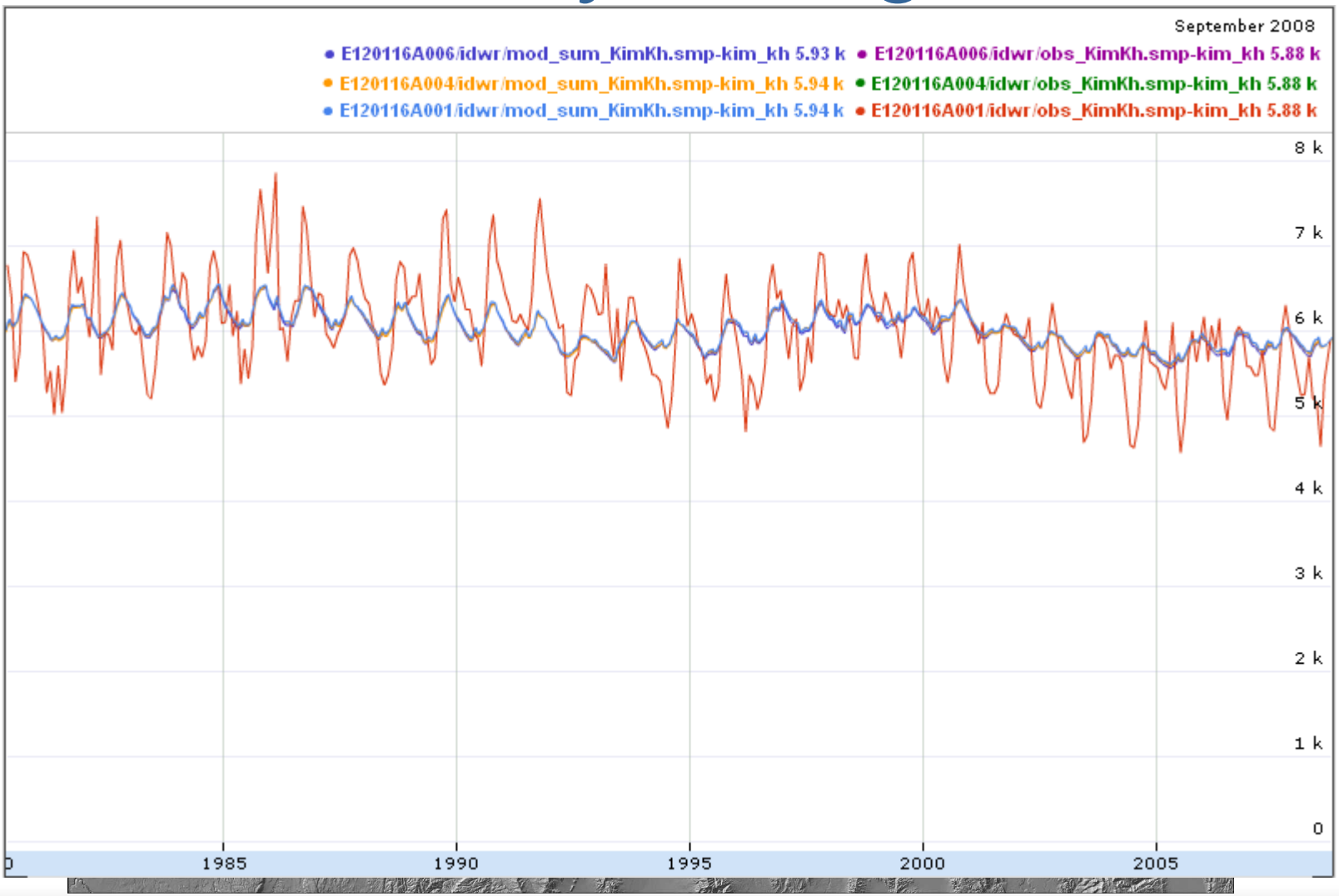
Neeley - Minidoka



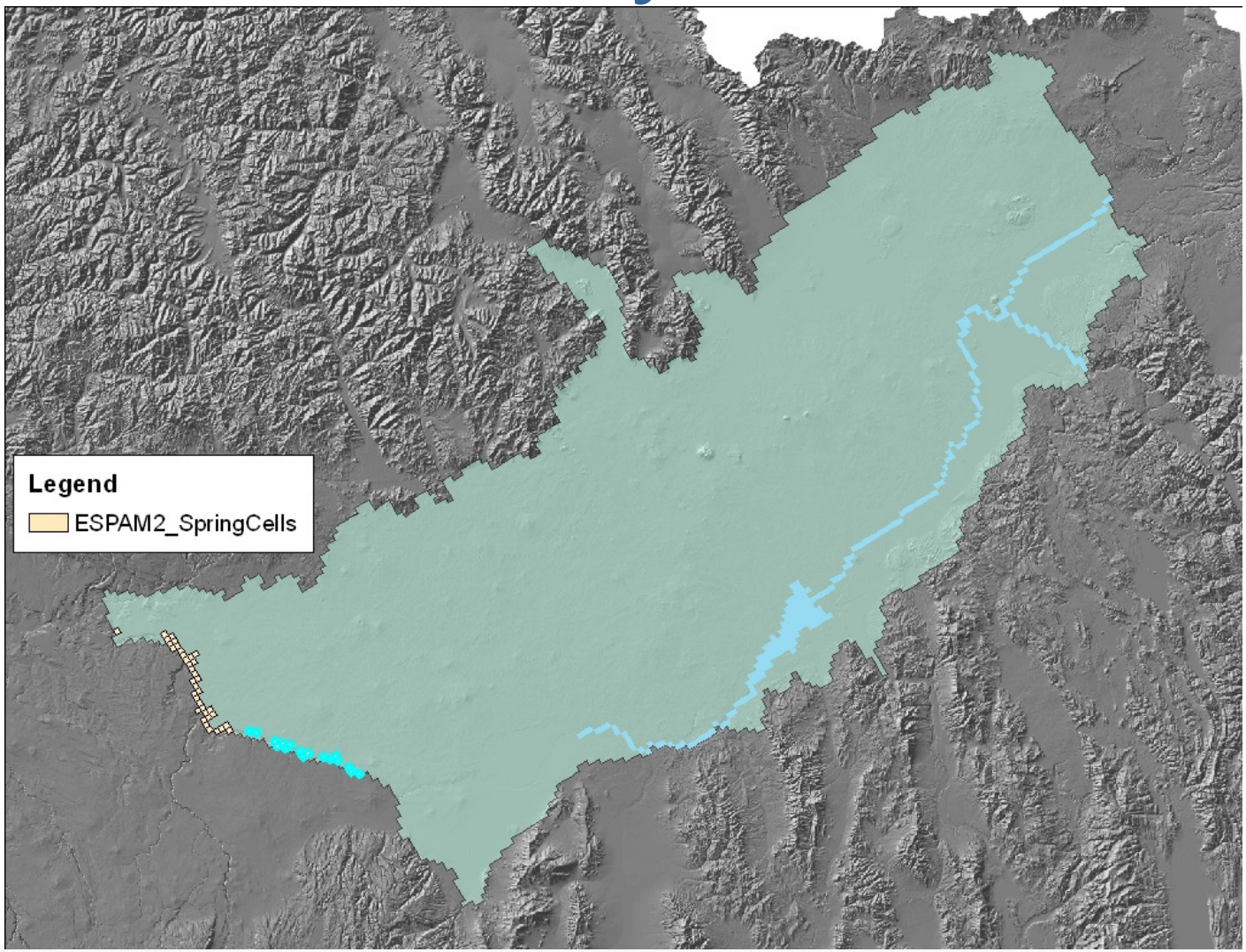
Kimberly – King Hill



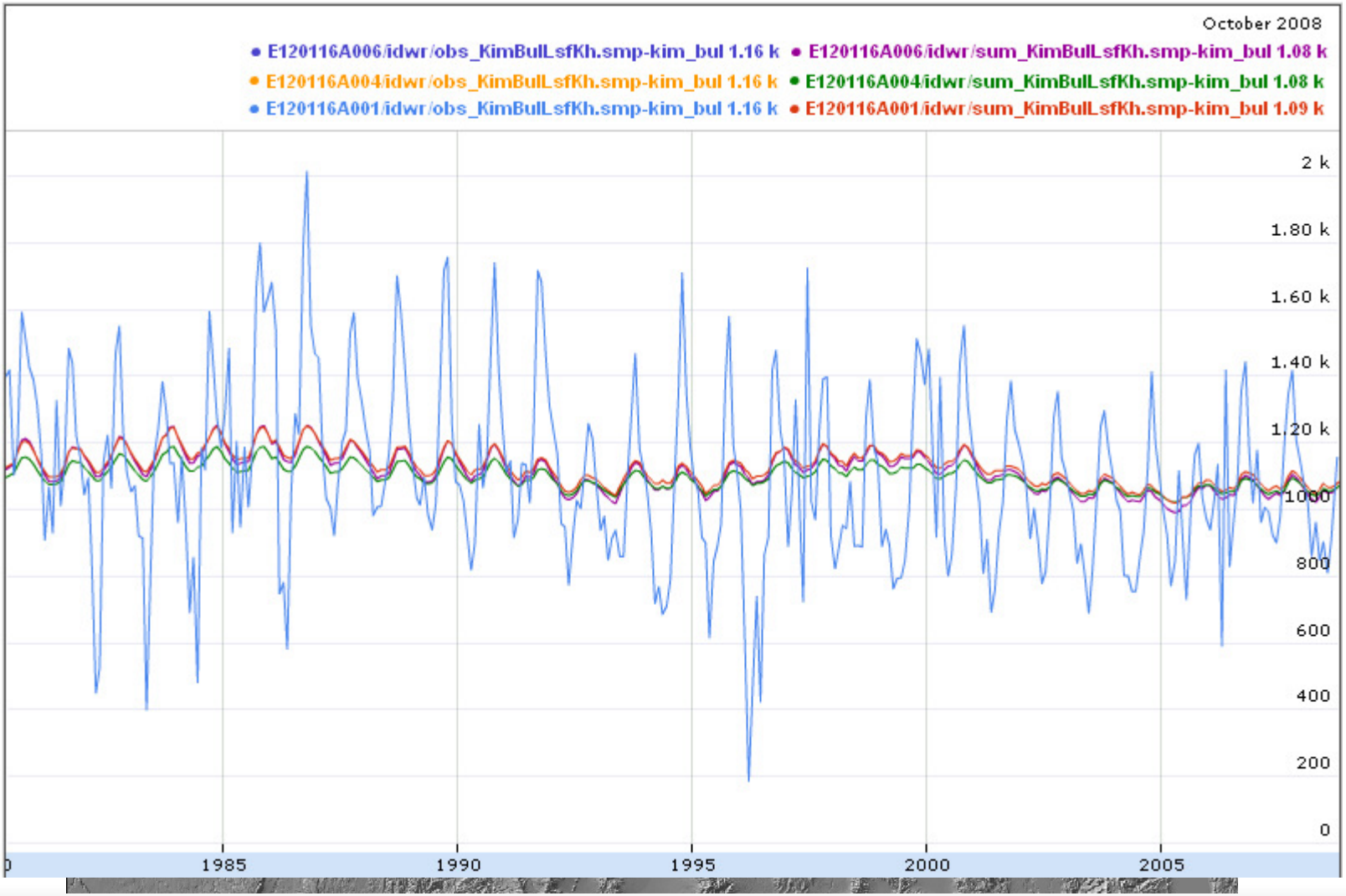
Kimberly – King Hill



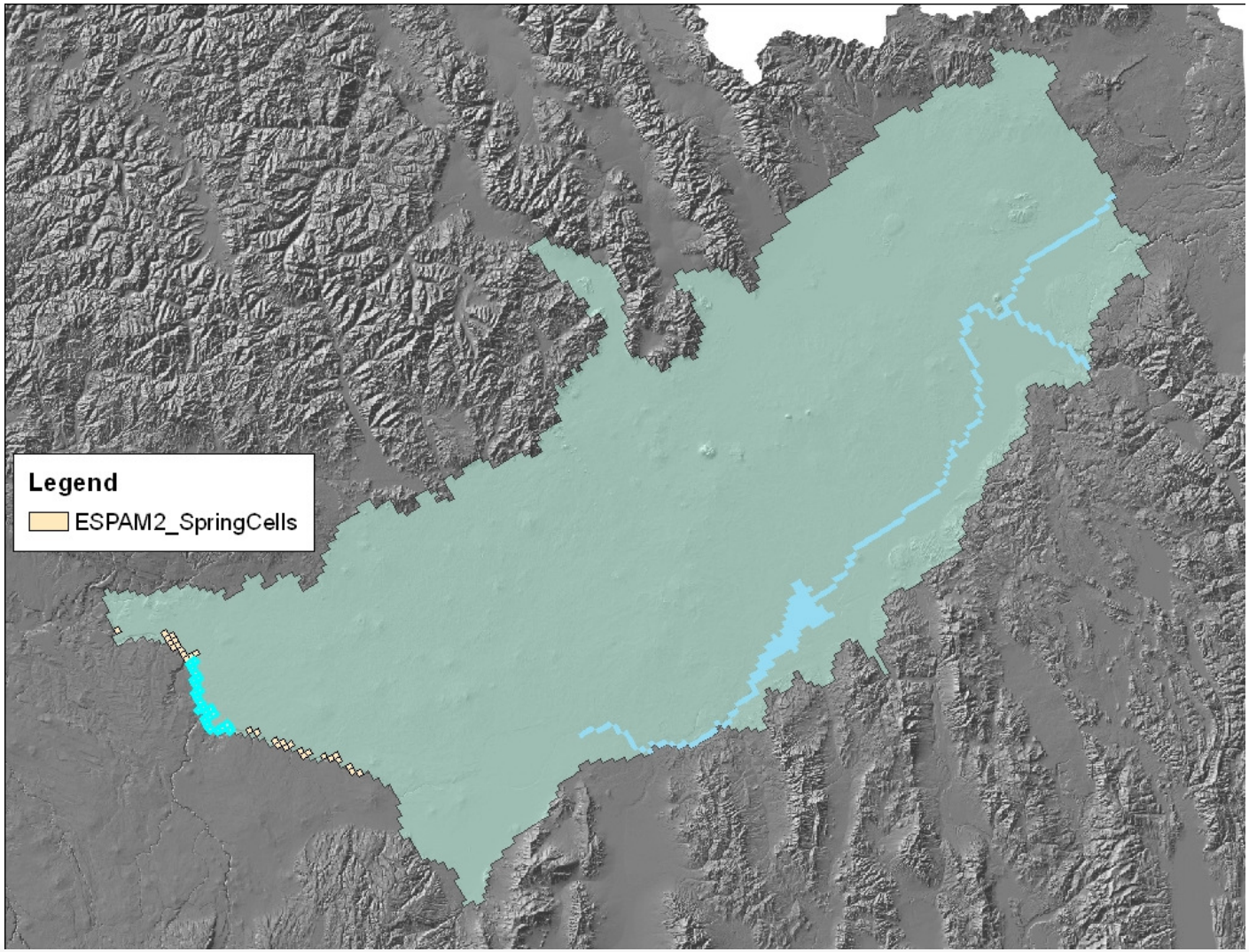
Kimberly – Buhl



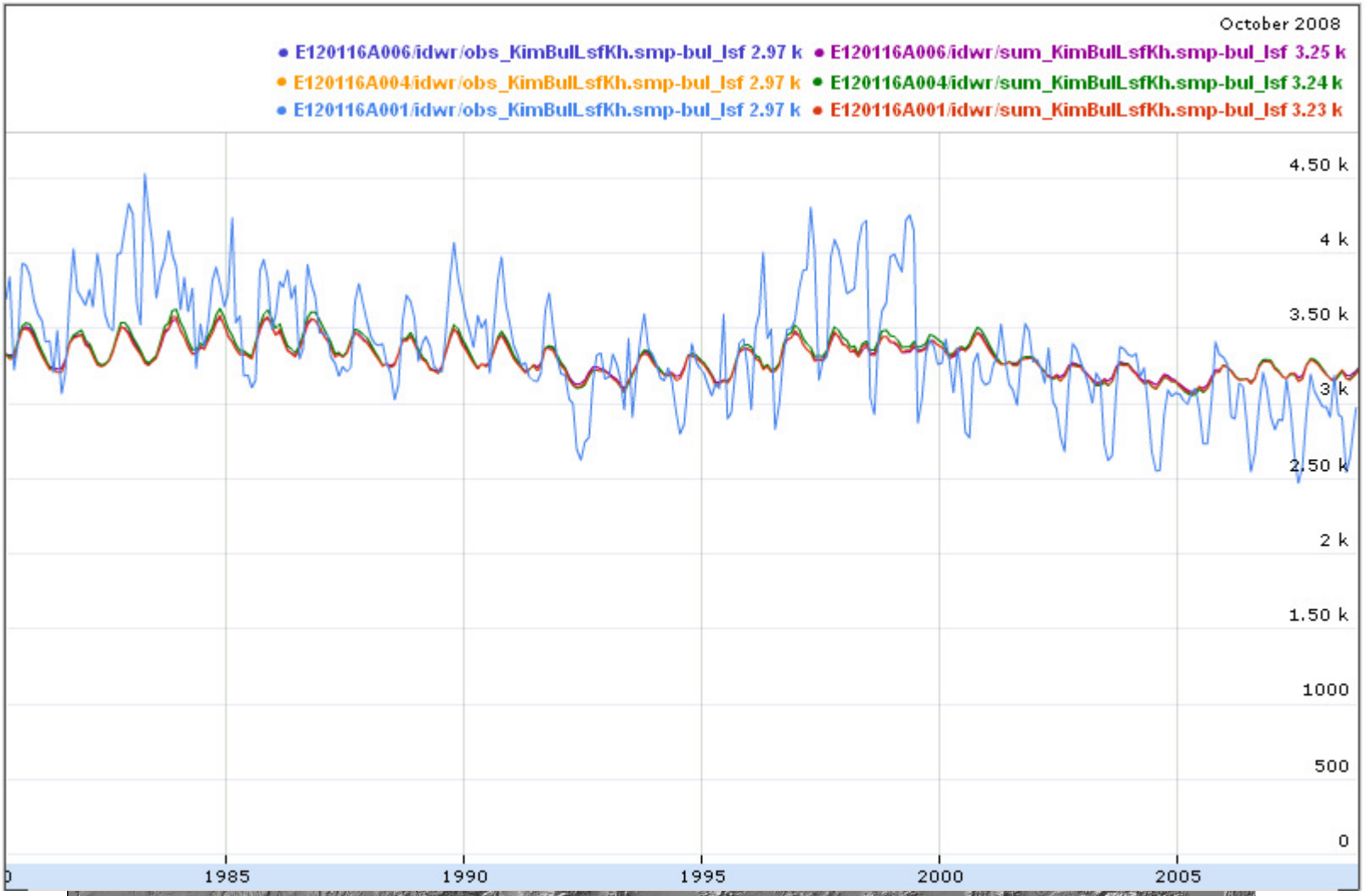
Kimberly – Buhl



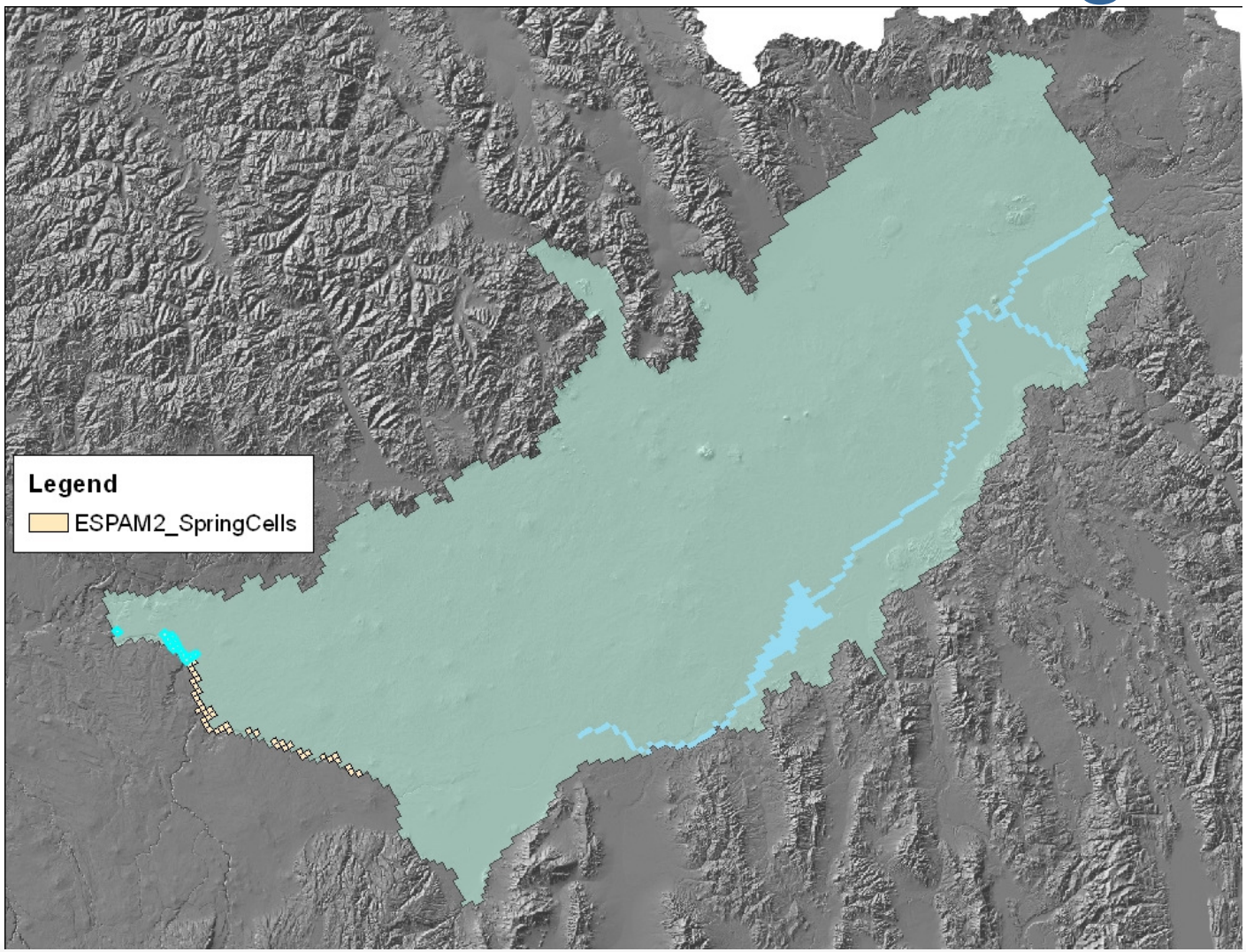
Buhl-Lower Salmon Falls



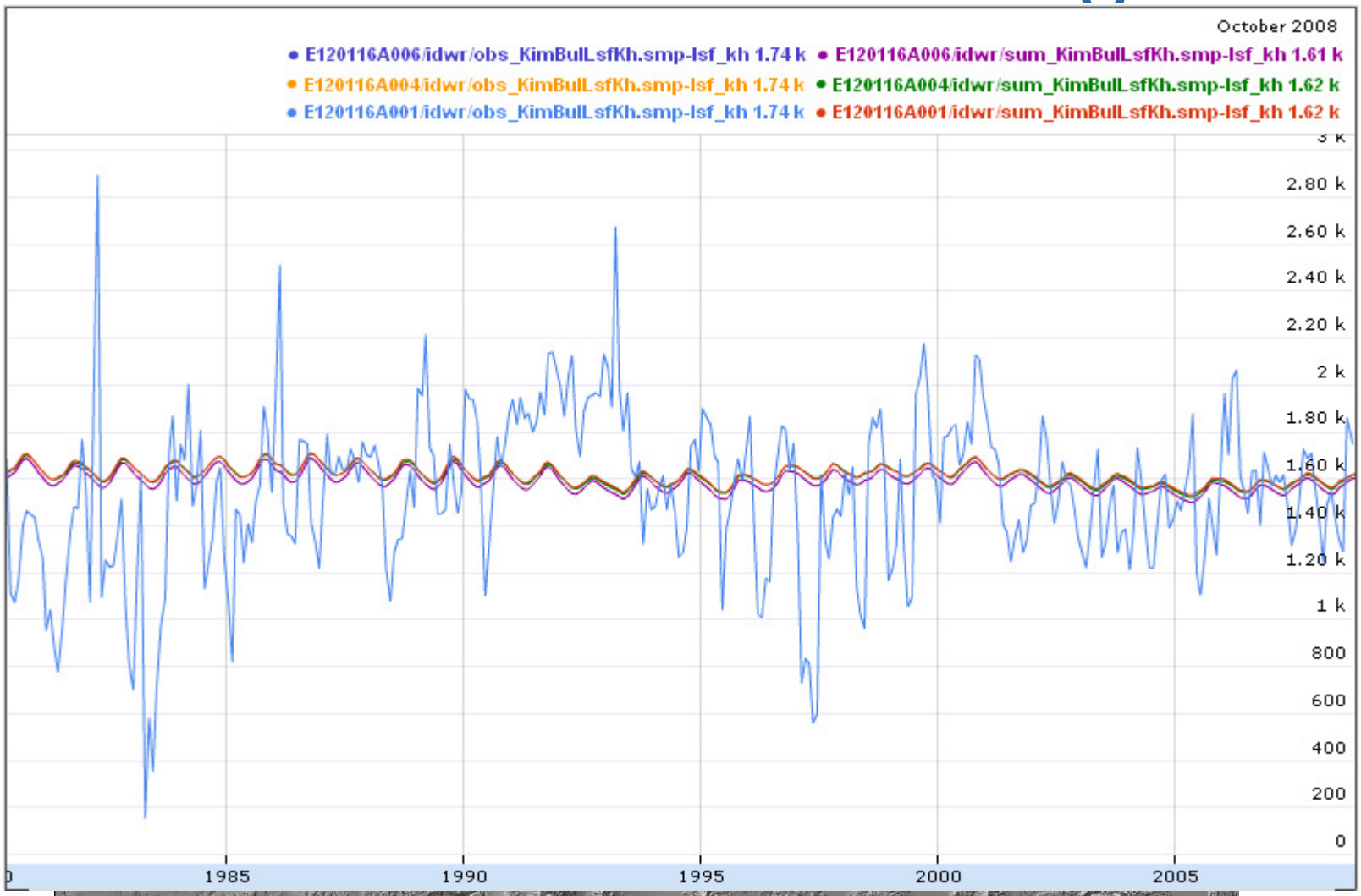
Buhl-Lower Salmon Falls



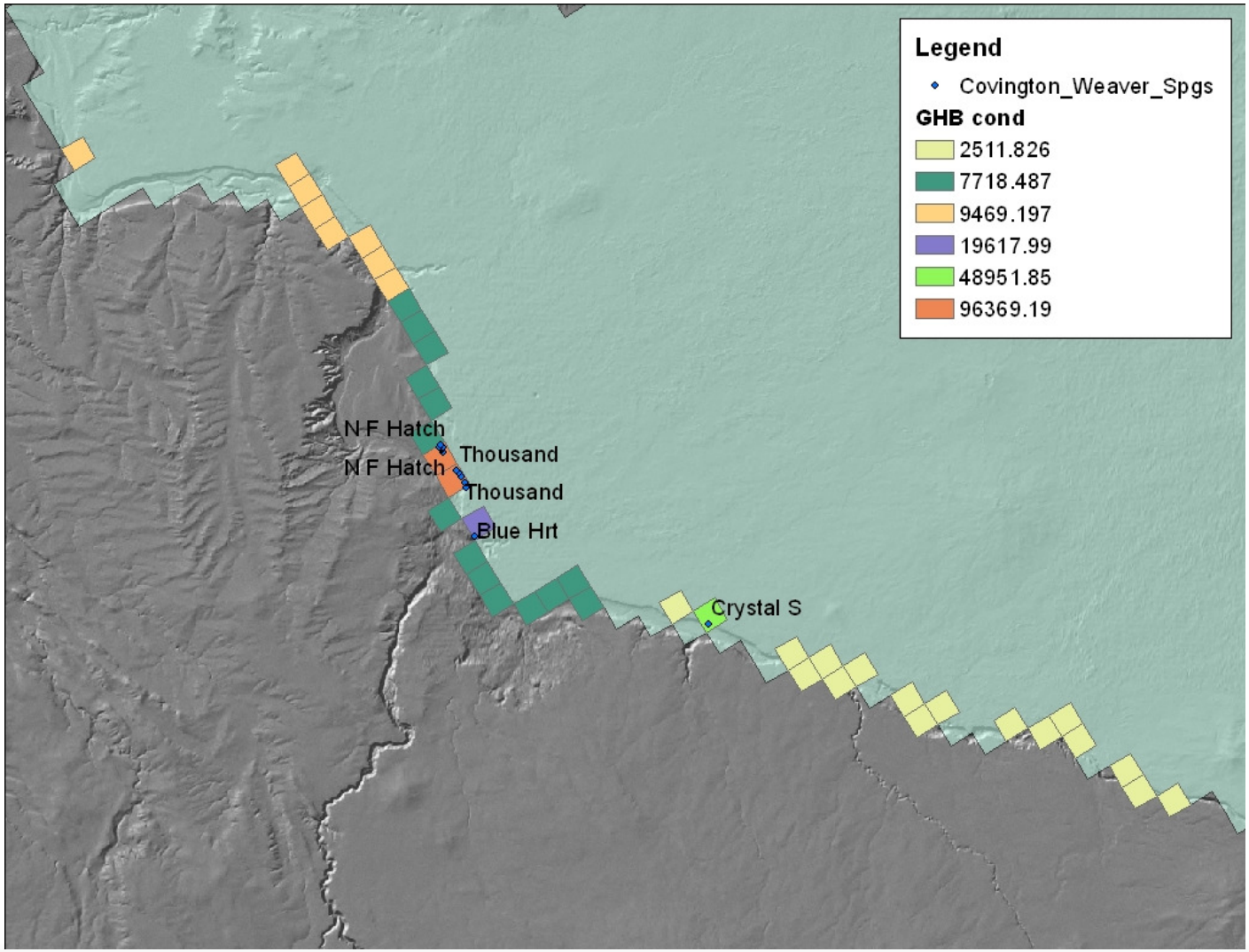
Lower Salmon Falls-King Hill



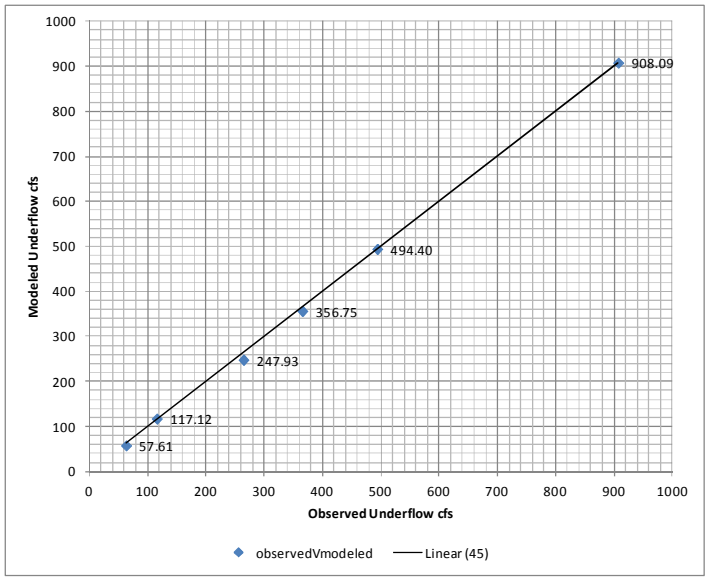
Lower Salmon Falls-King Hill



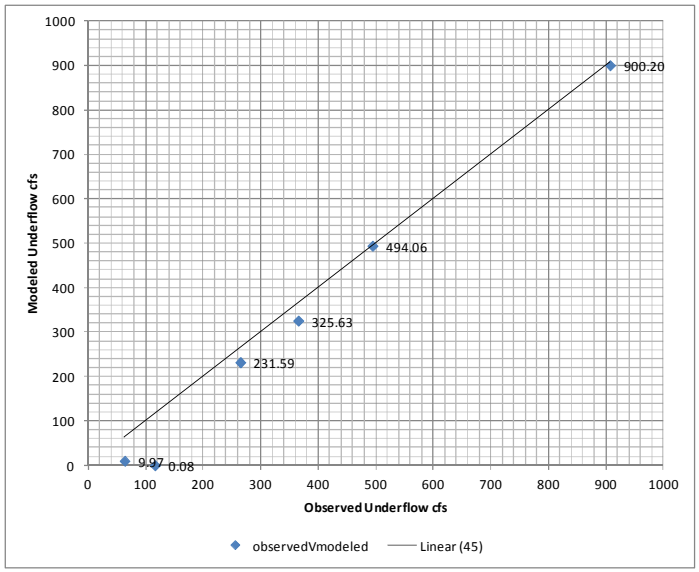
Underflow


Legend
Covington_Weaver_Spgs
GHB cond
2511.826
7718.487
9469.197
19617.99
48951.85
96369.19
N F Hatch
Thousand
N F Hatch
Thousand
Blue Hrt
Crystal S

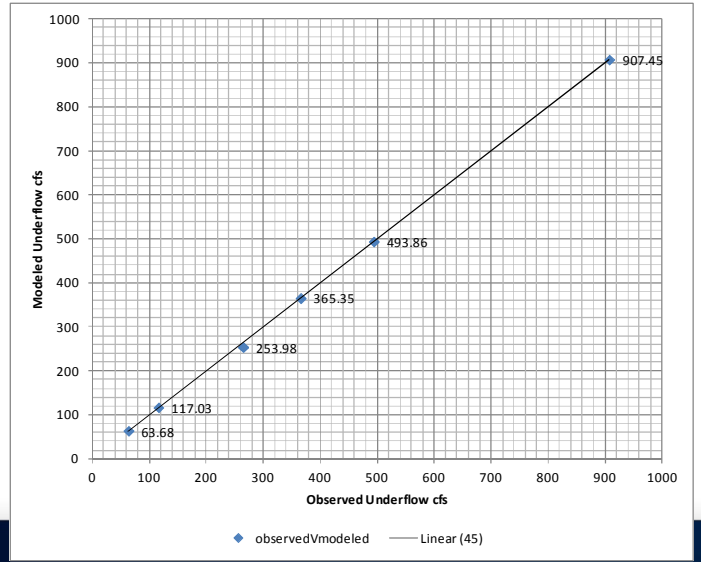
001



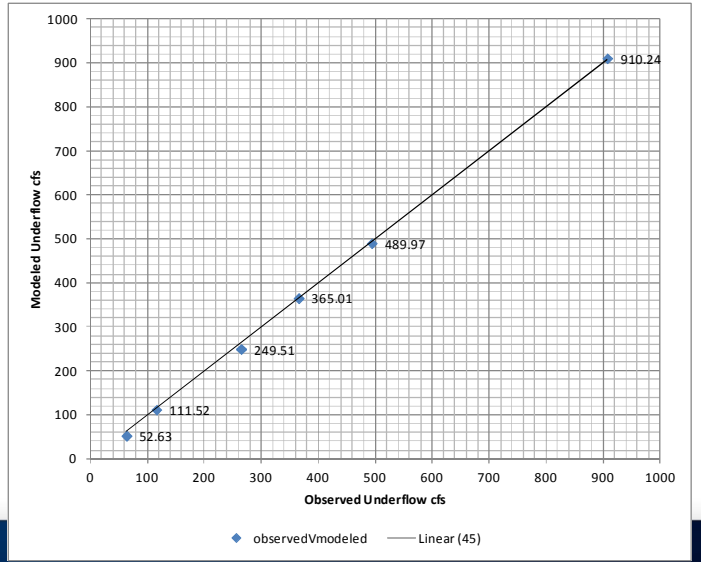
004

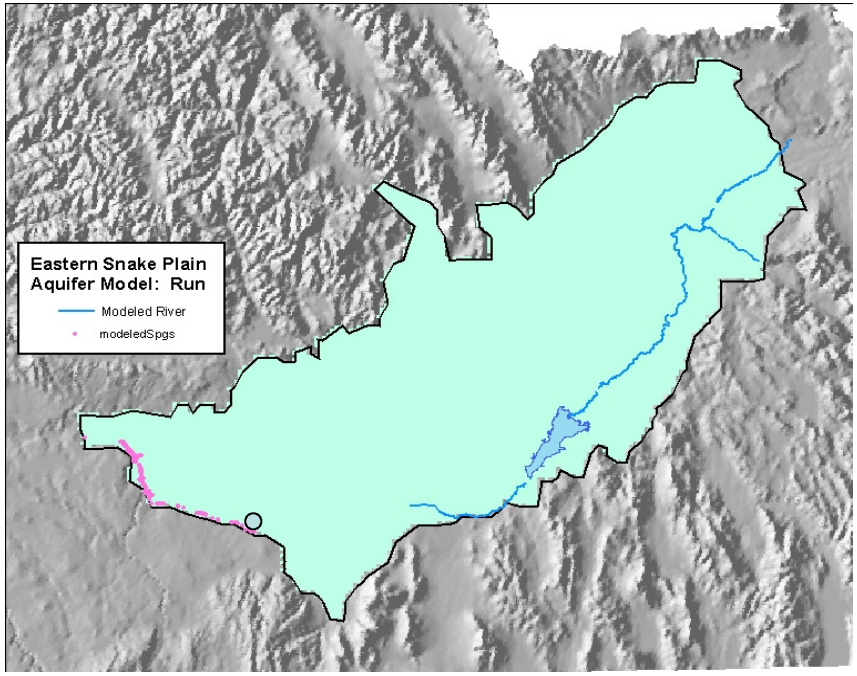


006

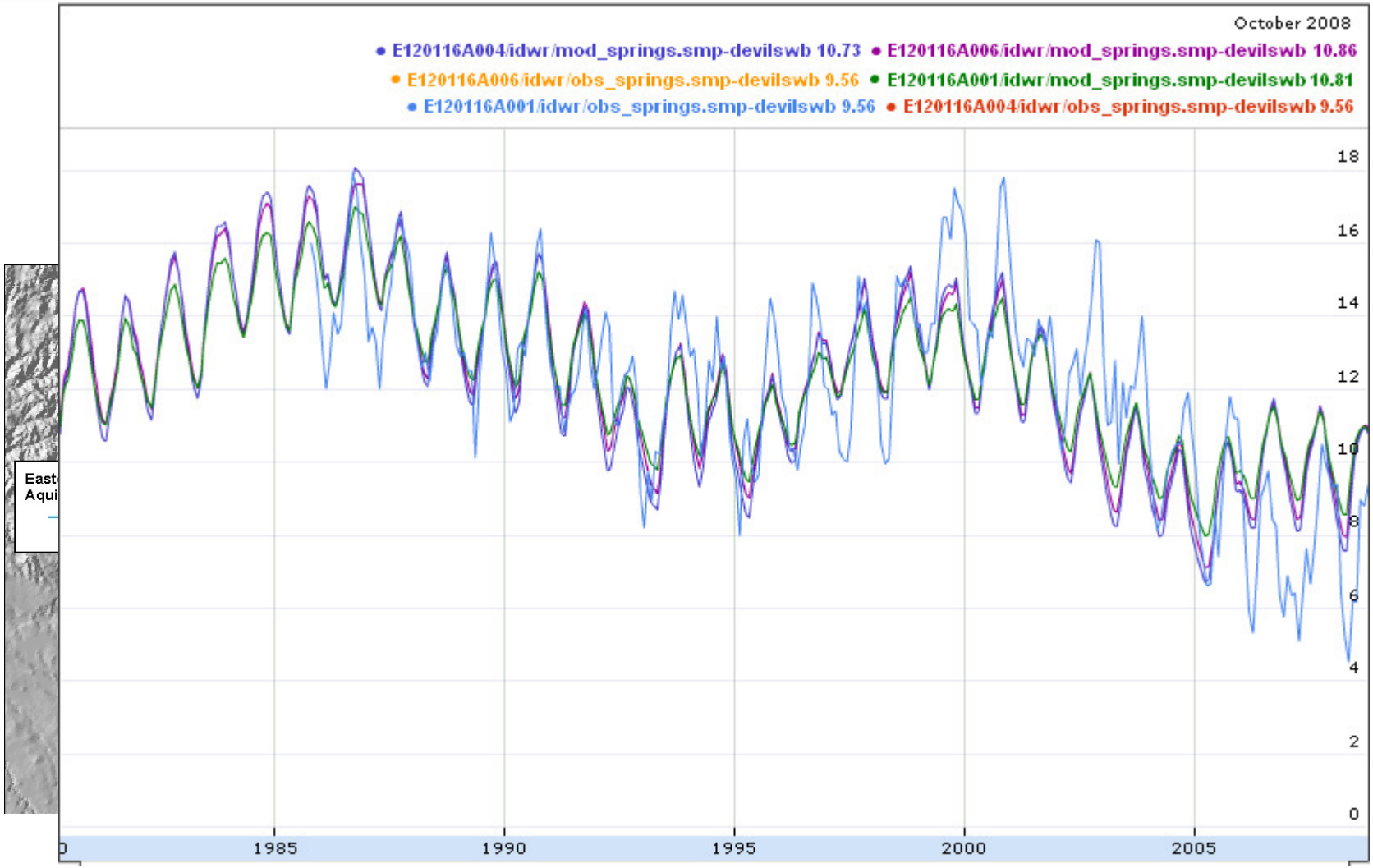


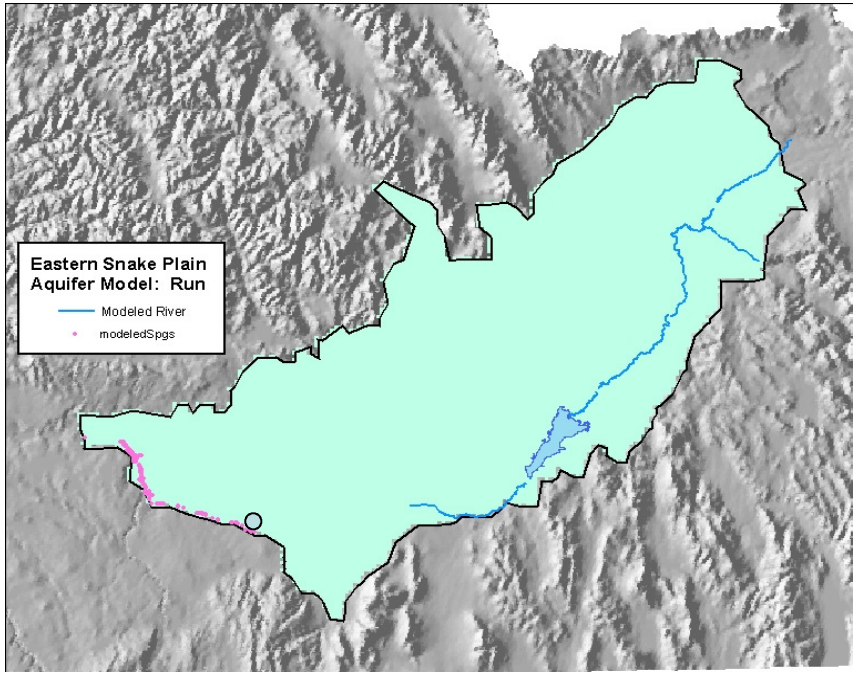
007



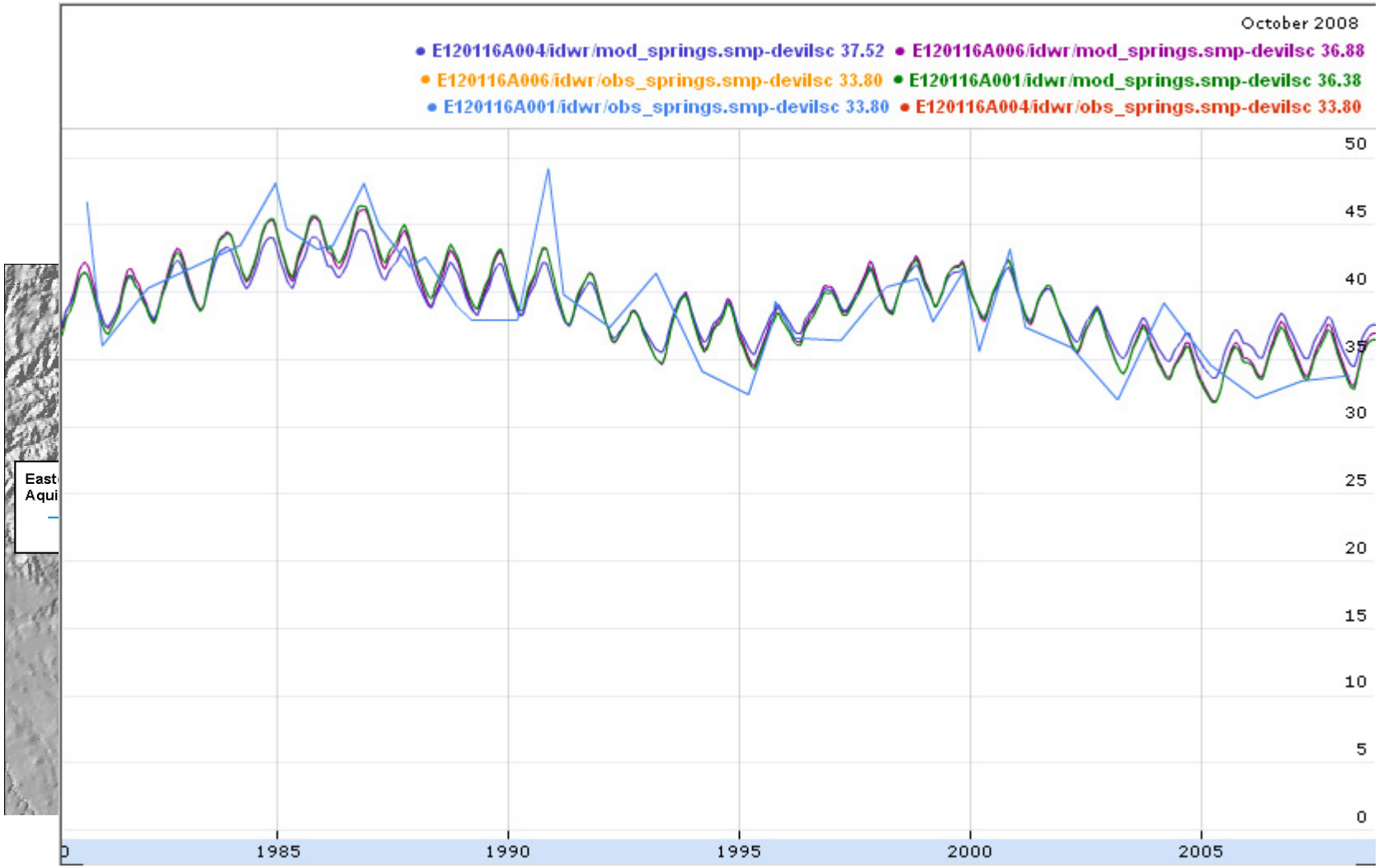


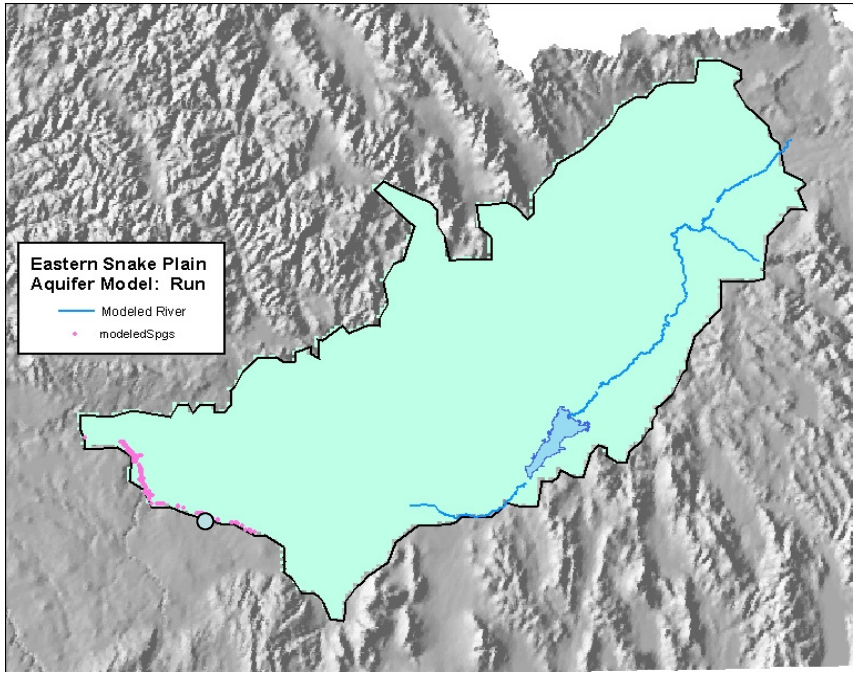
- Devils Washbowl


October 2008
E120116A004/idwr/mod_springs.smp-devilswb 10.73
E120116A006/idwr/mod_springs.smp-devilswb 10.86
E120116A006/idwr/obs_springs.smp-devilswb 9.56
E120116A001/idwr/mod_springs.smp-devilswb 10.81
E120116A001/idwr/obs_springs.smp-devilswb 9.56
E120116A004/idwr/obs_springs.smp-devilswb 9.56
18
16
14
12
10
8
6
4
2
0
1985
1990
1995
2000
2005

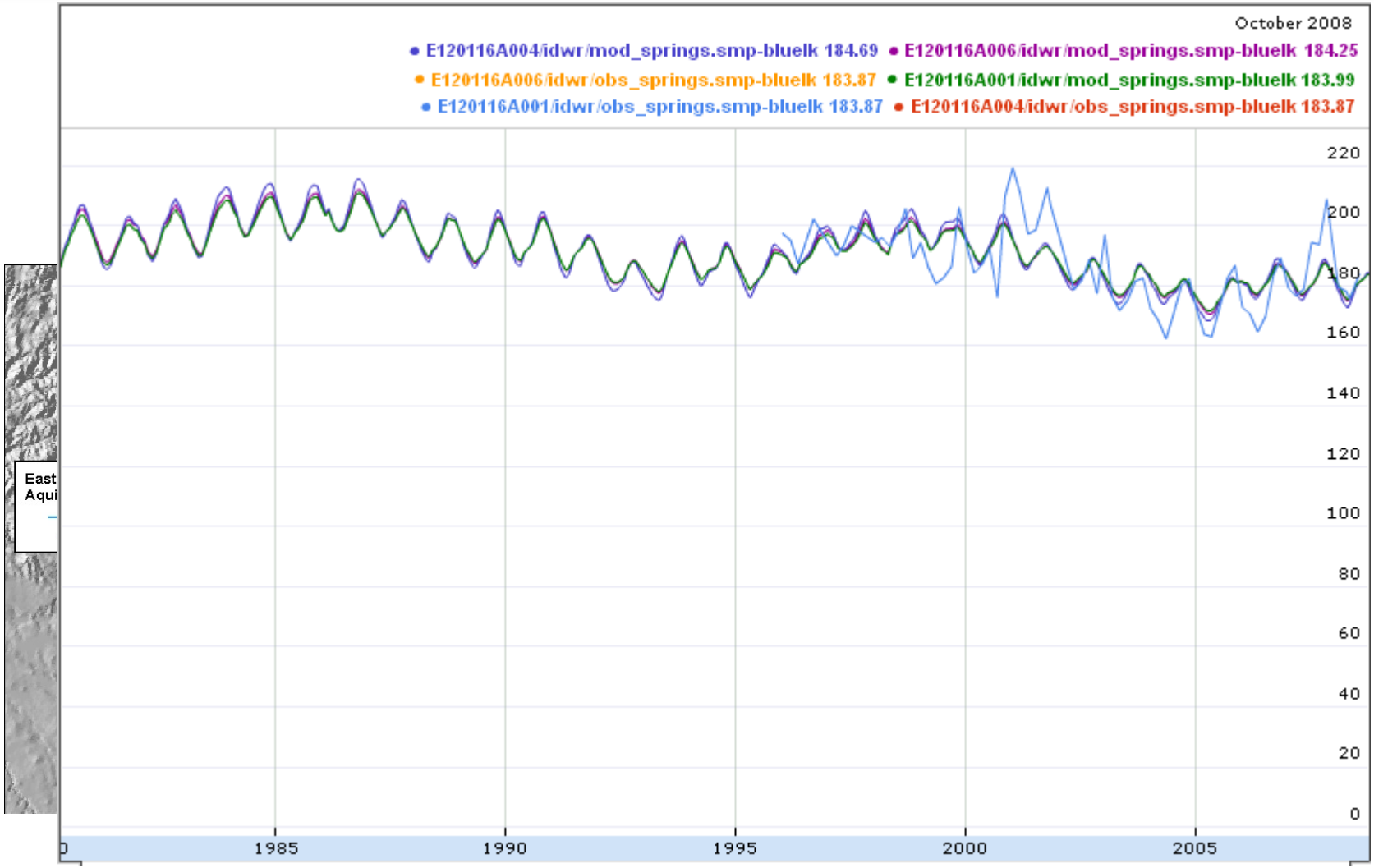


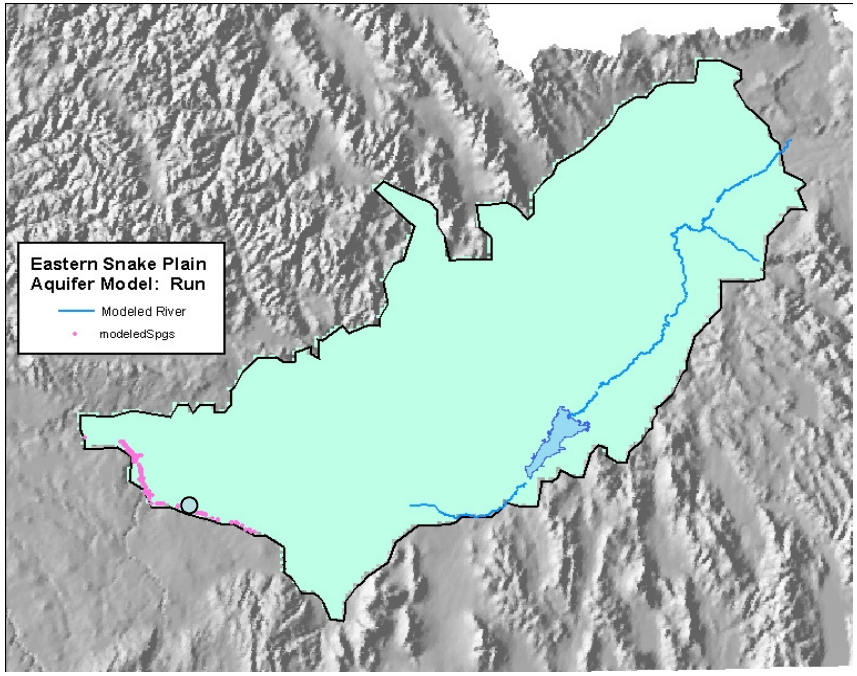
- Devils Corral


October 2008
E120116A004/idwr/mod_springs.smp-devilsc 37.52
E120116A006/idwr/mod_springs.smp-devilsc 36.88
E120116A006/idwr/obs_springs.smp-devilsc 33.80
E120116A001/idwr/mod_springs.smp-devilsc 36.38
E120116A001/idwr/obs_springs.smp-devilsc 33.80
E120116A004/idwr/obs_springs.smp-devilsc 33.80
50
45
40
35
30
25
20
15
10
5
0
1985
1990
1995
2000
2005

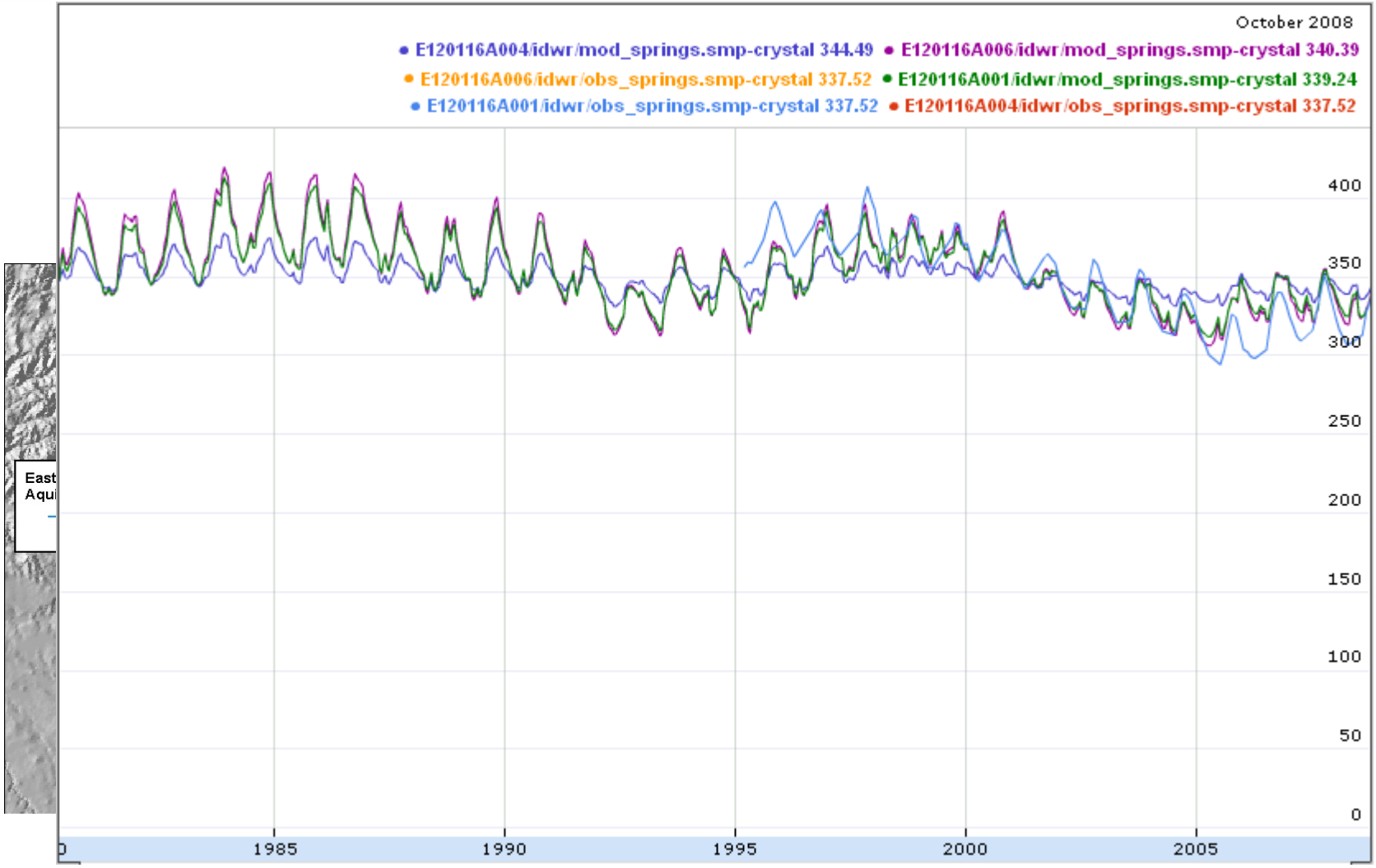

Eastern Snake Plain
Aquifer Model: Run
Modeled River
modeledSpgs

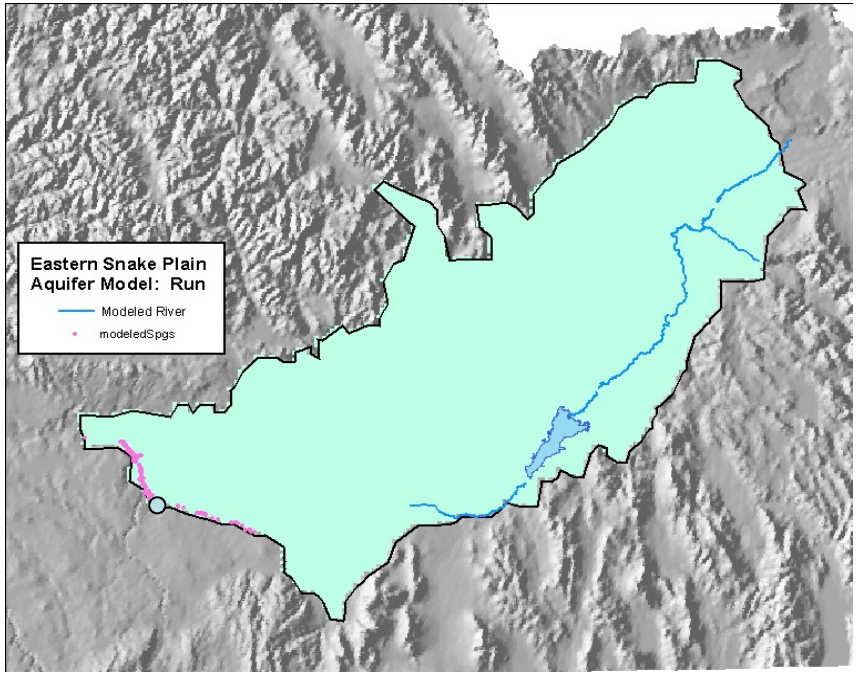
- Blue Lakes


October 2008
E120116A004/idwr/mod_springs.smp-bluelk 184.69
E120116A006/idwr/mod_springs.smp-bluelk 184.25
E120116A006/idwr/obs_springs.smp-bluelk 183.87
E120116A001/idwr/mod_springs.smp-bluelk 183.99
E120116A001/idwr/obs_springs.smp-bluelk 183.87
E120116A004/idwr/obs_springs.smp-bluelk 183.87
220
200
180
160
140
120
100
80
60
40
20
0
1985
1990
1995
2000
2005
East
Aqui

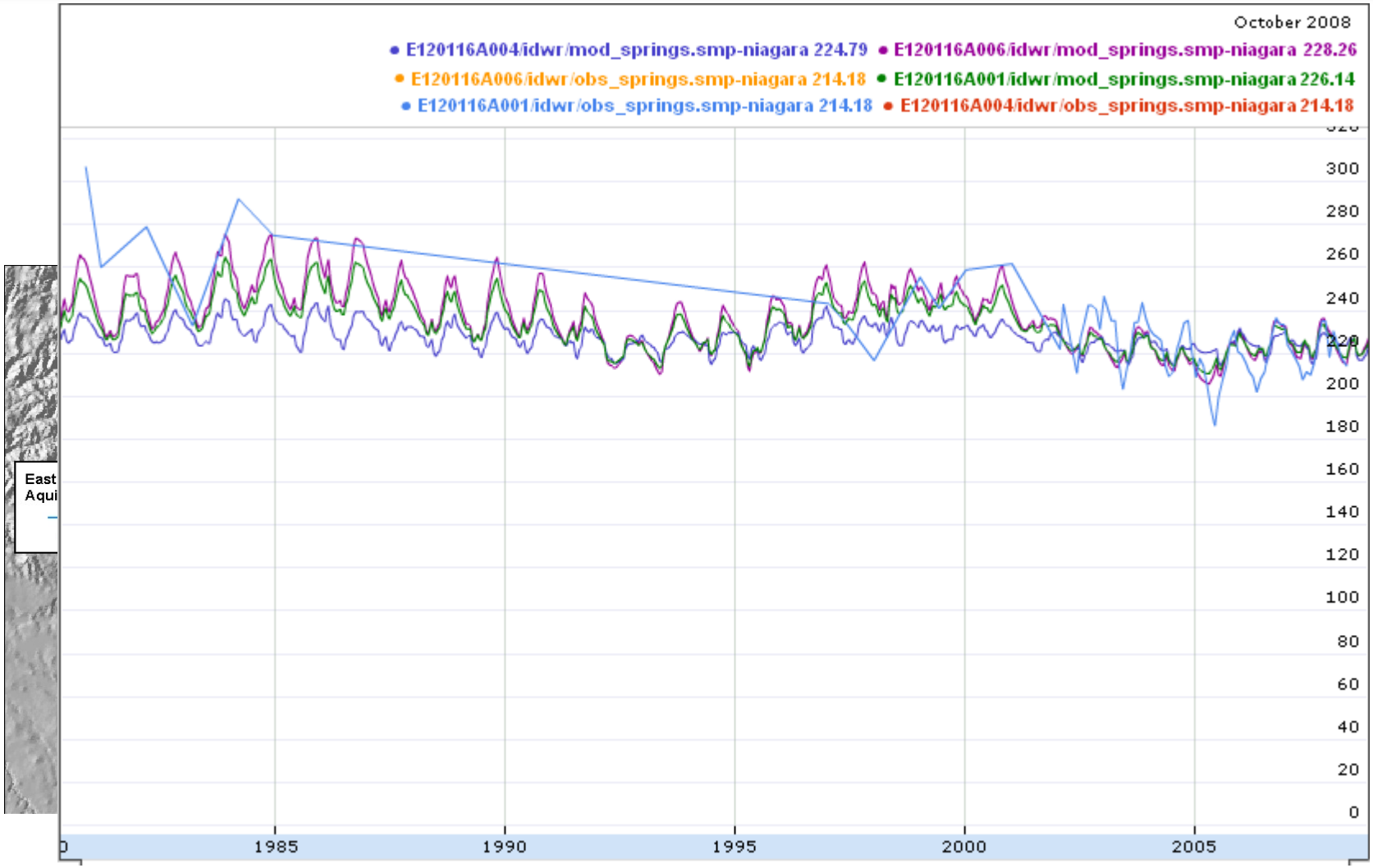


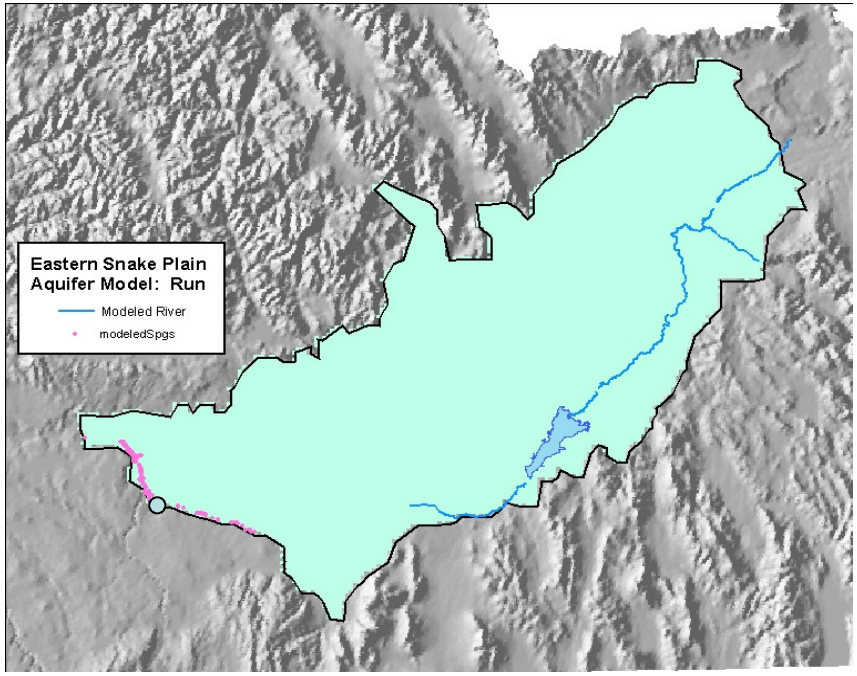
- Crystal Springs


October 2008
E120116A004/idwr/mod_springs.smp-crystal 344.49
E120116A006/idwr/mod_springs.smp-crystal 340.39
E120116A006/idwr/obs_springs.smp-crystal 337.52
E120116A001/idwr/mod_springs.smp-crystal 339.24
E120116A001/idwr/obs_springs.smp-crystal 337.52
E120116A004/idwr/obs_springs.smp-crystal 337.52
400
350
300
250
200
150
100
50
0
1985
1990
1995
2000
2005

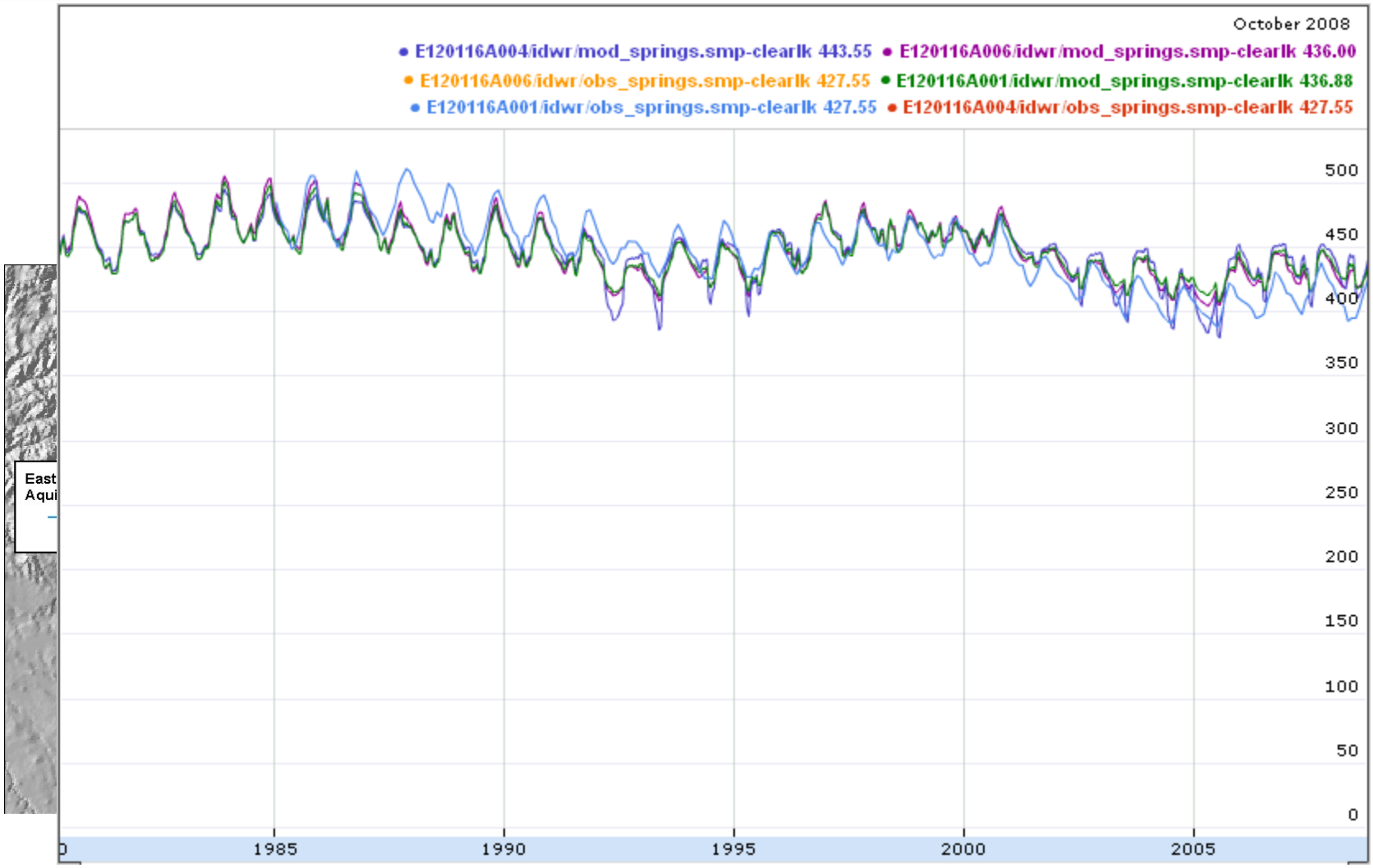

Eastern Snake Plain
Aquifer Model: Run
Modeled River
modeledSpgs

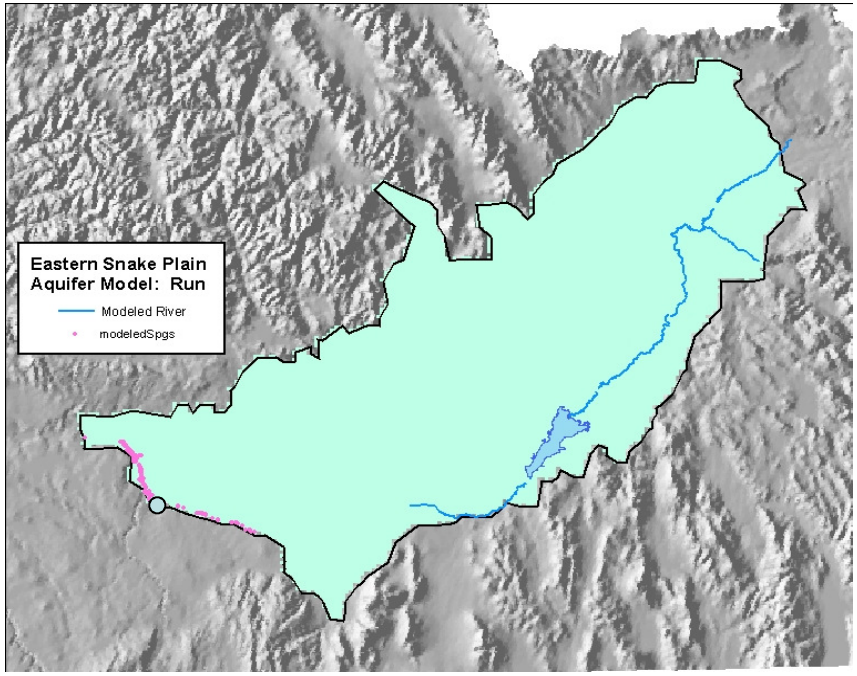
- Niagara


October 2008
E120116A004/idwr/mod_springs.smp-niagara 224.79
E120116A006/idwr/mod_springs.smp-niagara 228.26
E120116A006/idwr/obs_springs.smp-niagara 214.18
E120116A001/idwr/mod_springs.smp-niagara 226.14
E120116A001/idwr/obs_springs.smp-niagara 214.18
E120116A004/idwr/obs_springs.smp-niagara 214.18
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
1985
1990
1995
2000
2005
East
Aqui

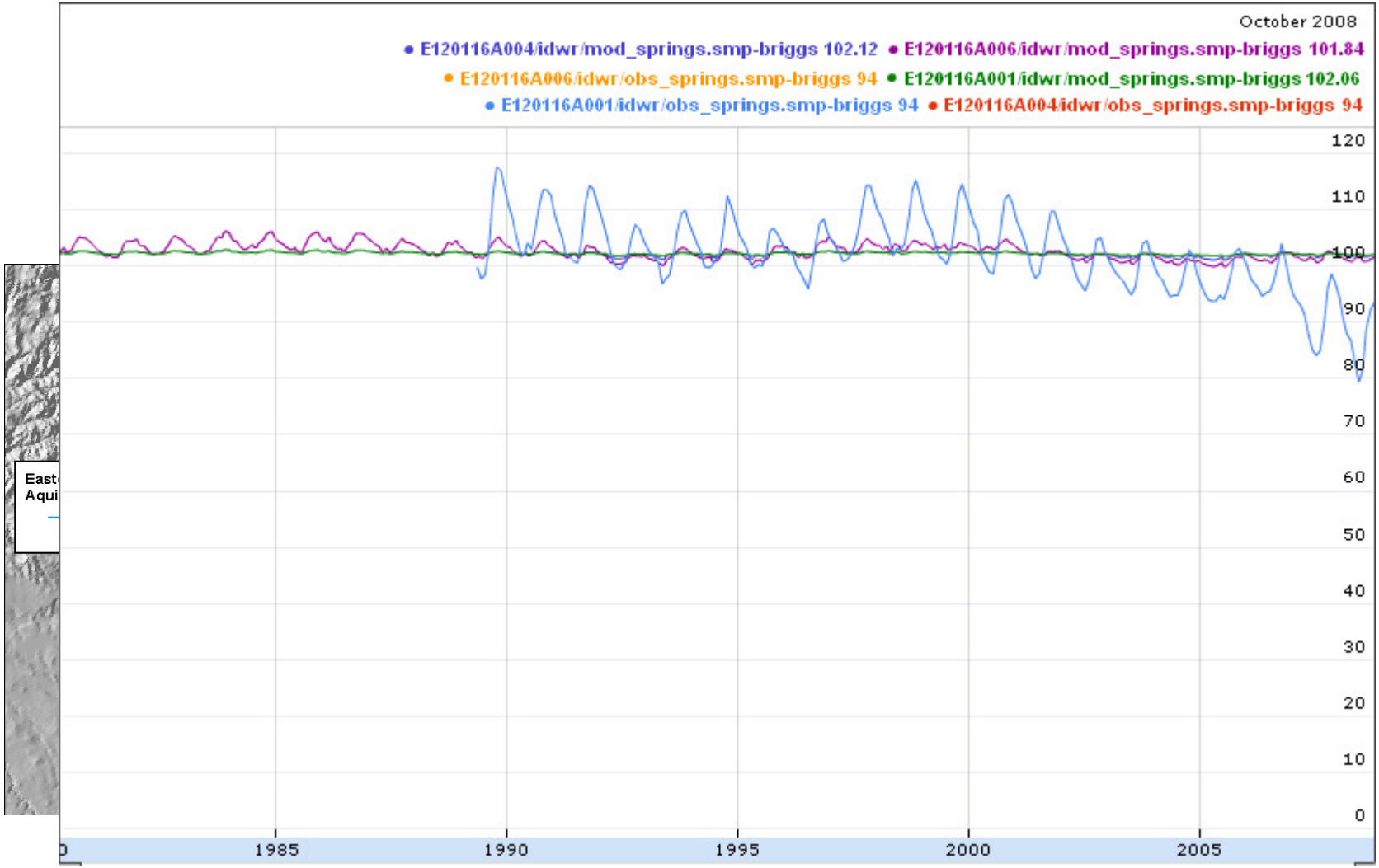

Eastern Snake Plain
Aquifer Model: Run
Modeled River
modeledSpgs

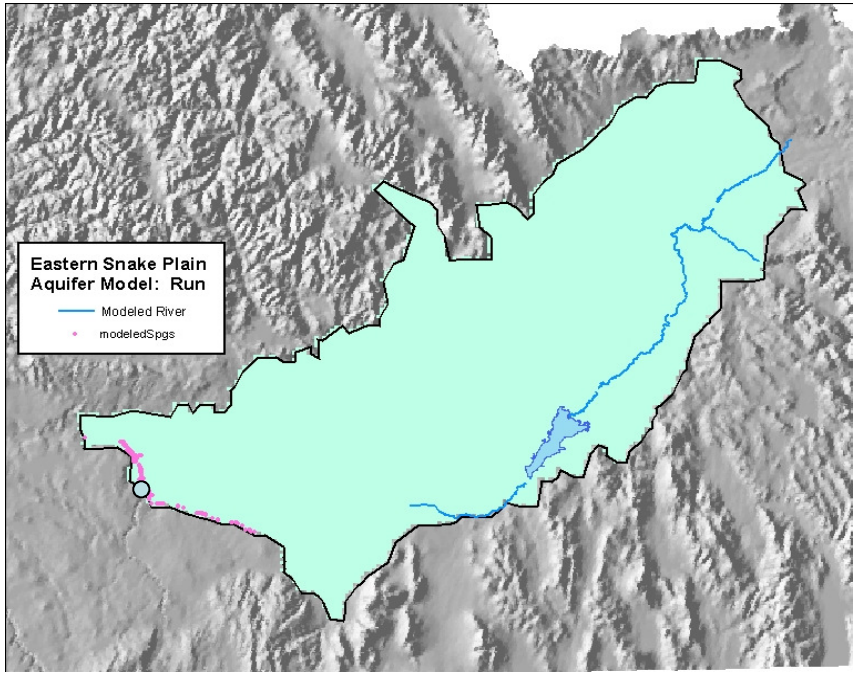
- Clear Lakes


October 2008
E120116A004/idwr/mod_springs.smp-clearlk 443.55
E120116A006/idwr/mod_springs.smp-clearlk 436.00
E120116A006/idwr/obs_springs.smp-clearlk 427.55
E120116A001/idwr/mod_springs.smp-clearlk 436.88
E120116A001/idwr/obs_springs.smp-clearlk 427.55
E120116A004/idwr/obs_springs.smp-clearlk 427.55
500
450
400
350
300
250
200
150
100
50
0
1985
1990
1995
2000
2005
East
Aqui

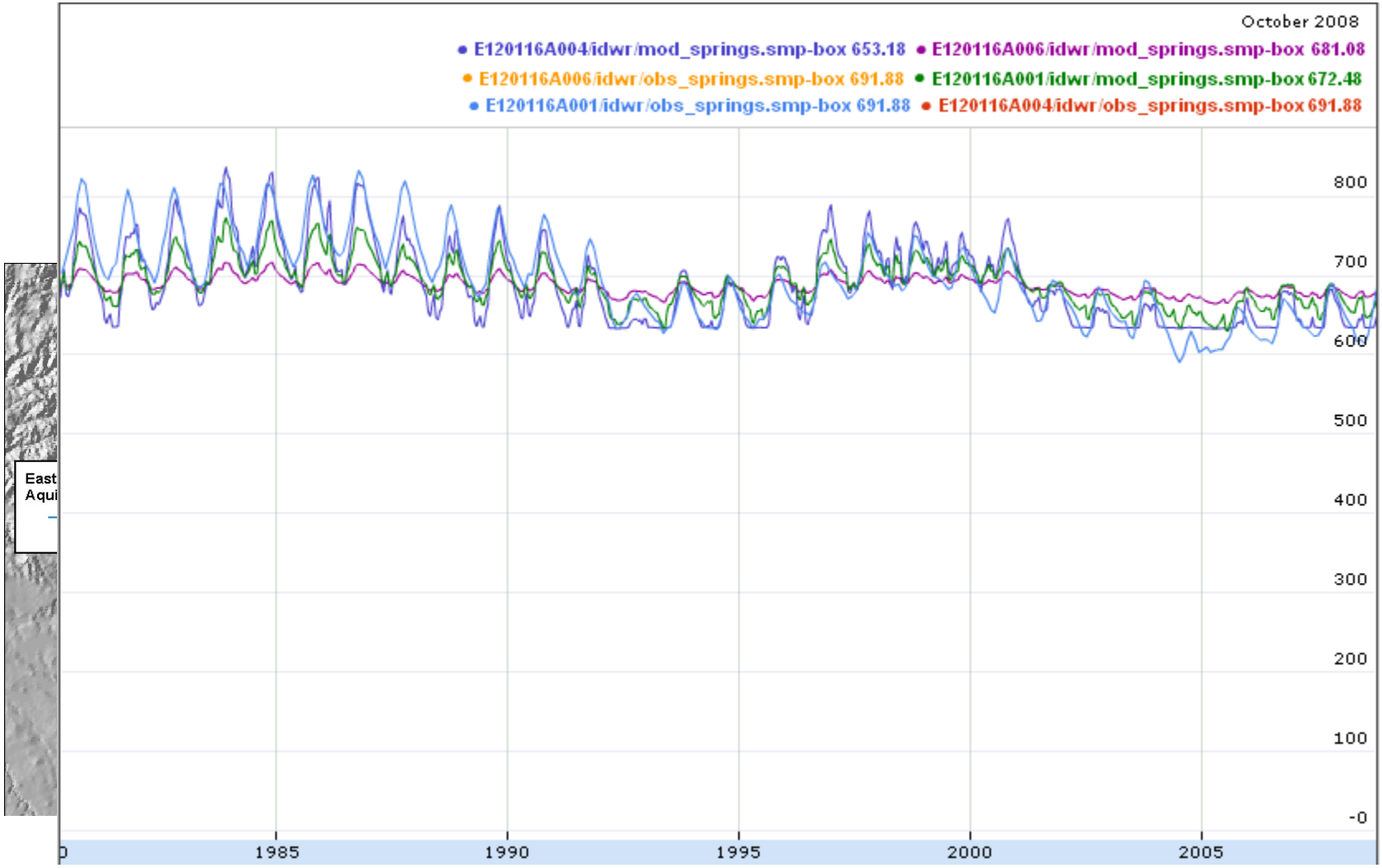


- Briggs Spring

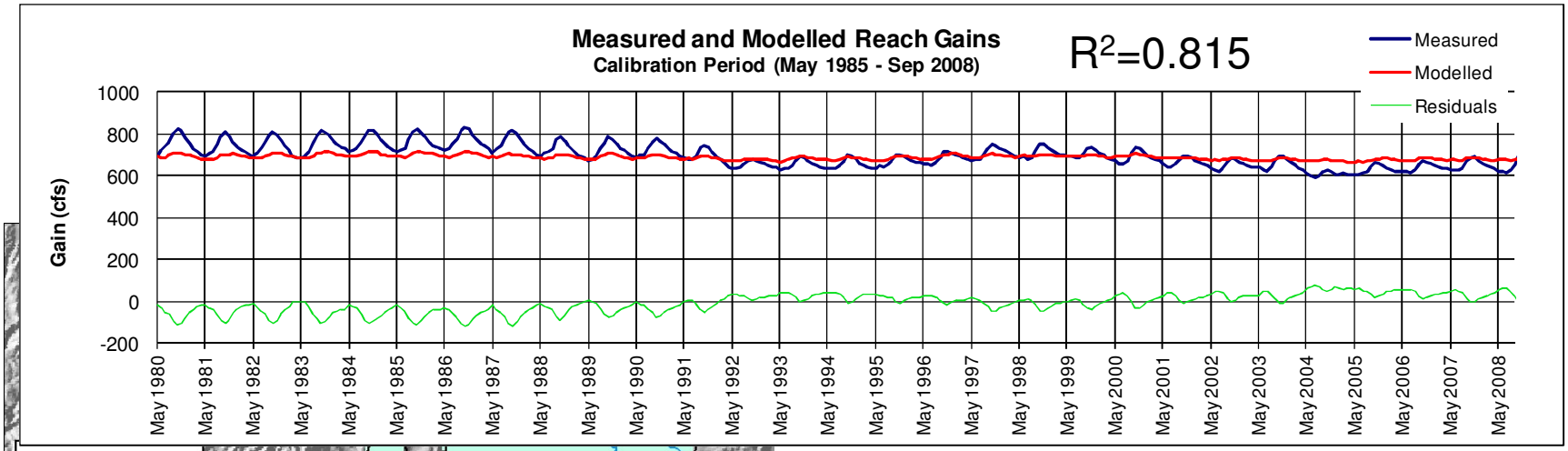

October 2008
E120116A004/idwr/mod_springs.smp-briggs 102.12
E120116A006/idwr/mod_springs.smp-briggs 101.84
E120116A006/idwr/obs_springs.smp-briggs 94
E120116A001/idwr/mod_springs.smp-briggs 102.06
E120116A001/idwr/obs_springs.smp-briggs 94
E120116A004/idwr/obs_springs.smp-briggs 94
120
110
100
90
80
70
60
50
40
30
20
10
0
1985
1990
1995
2000
2005

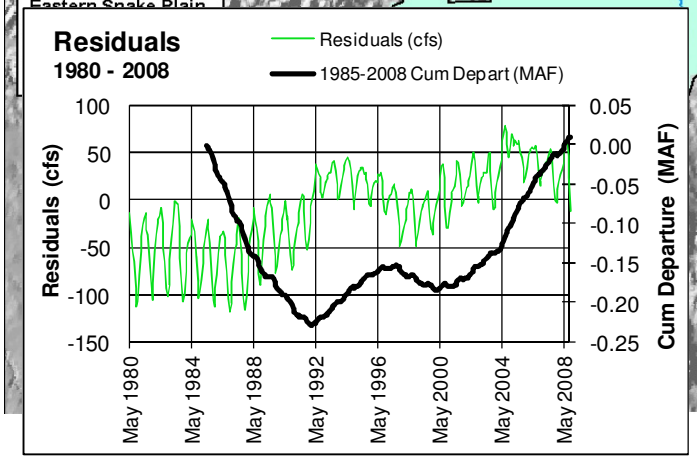


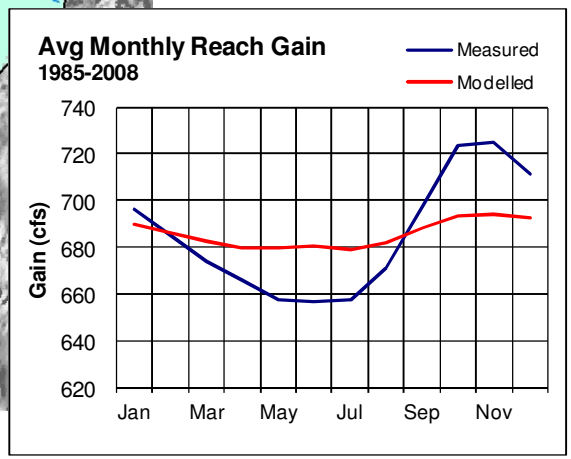
- Box Canyon Spring

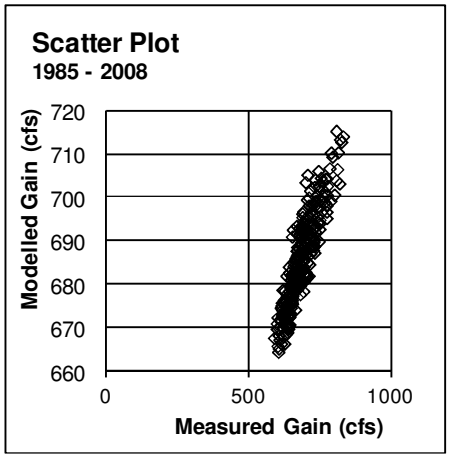

October 2008
E120116A004/idwr/mod_springs.smp-box 653.18
E120116A006/idwr/mod_springs.smp-box 681.08
E120116A006/idwr/obs_springs.smp-box 691.88
E120116A001/idwr/mod_springs.smp-box 672.48
E120116A001/idwr/obs_springs.smp-box 691.88
E120116A004/idwr/obs_springs.smp-box 691.88
800
700
600
500
400
300
200
100
-0
1985
1990
1995
2000
2005

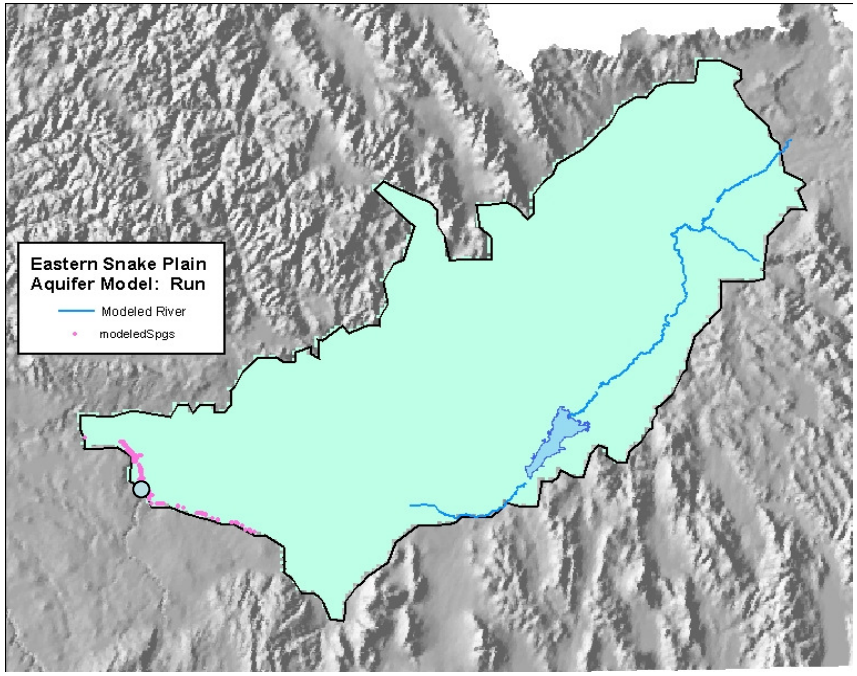
E120116A006



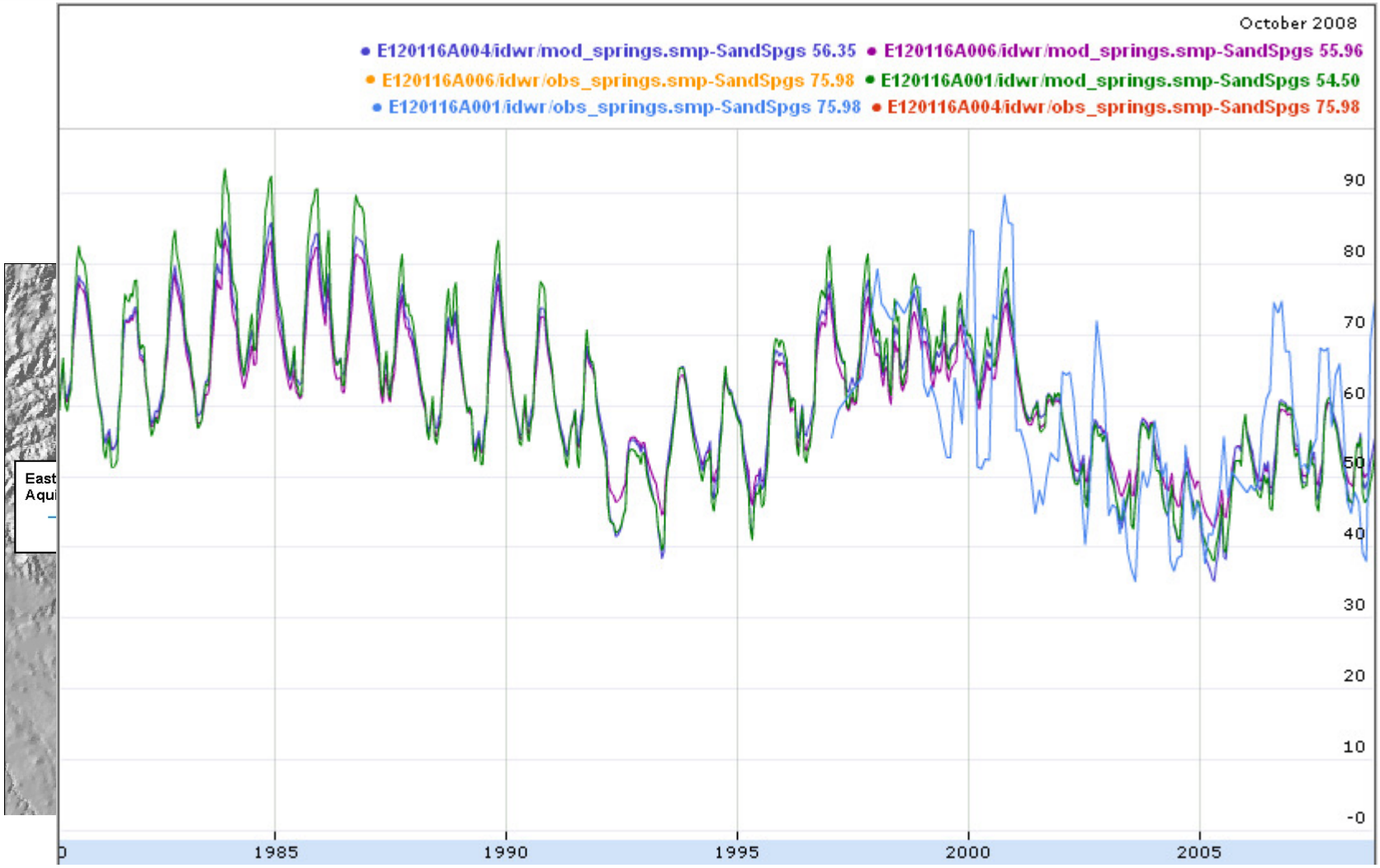


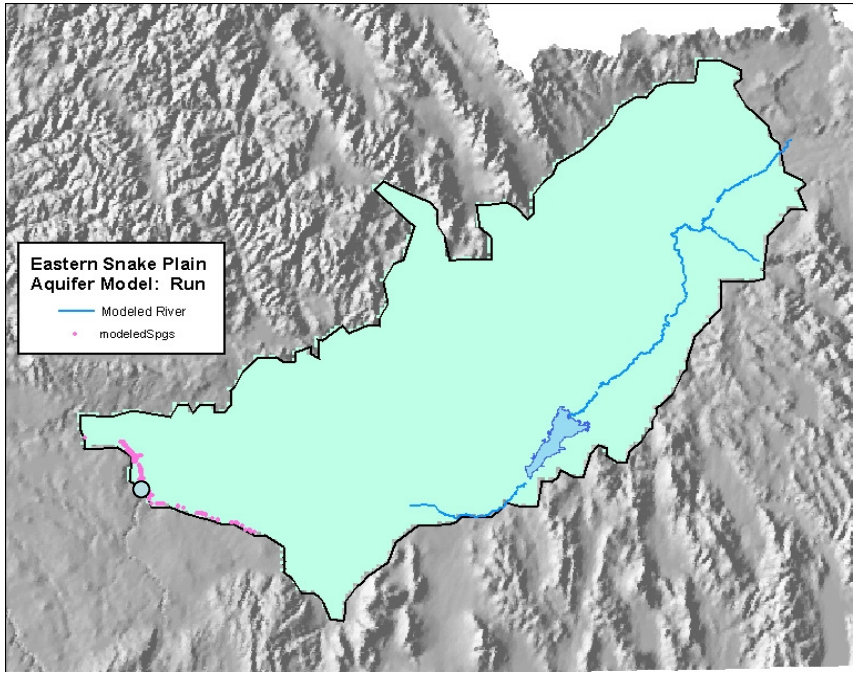




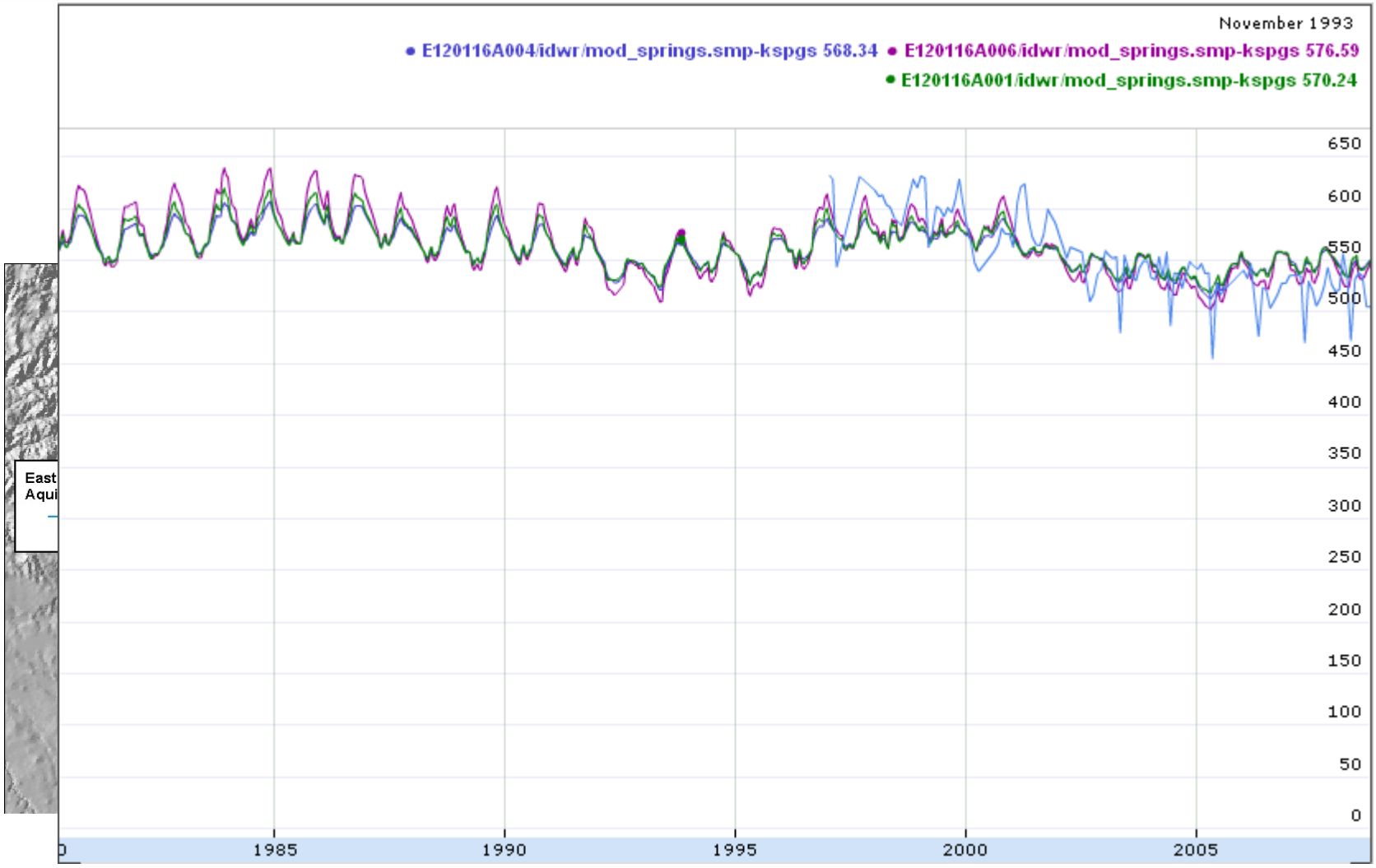


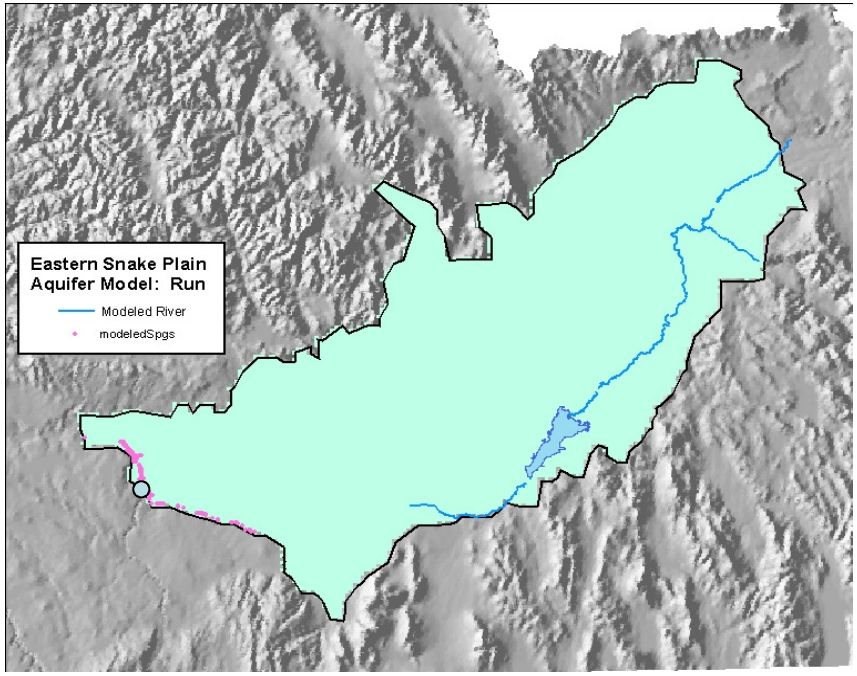
- Sand Springs


October 2008
E120116A004/idwr/mod_springs.smp-SandSpgs 56.35
E120116A006/idwr/mod_springs.smp-SandSpgs 55.96
E120116A006/idwr/obs_springs.smp-SandSpgs 75.98
E120116A001/idwr/mod_springs.smp-SandSpgs 54.50
E120116A001/idwr/obs_springs.smp-SandSpgs 75.98
E120116A004/idwr/obs_springs.smp-SandSpgs 75.98
90
80
70
60
50
40
30
20
10
-0
1985
1990
1995
2000
2005

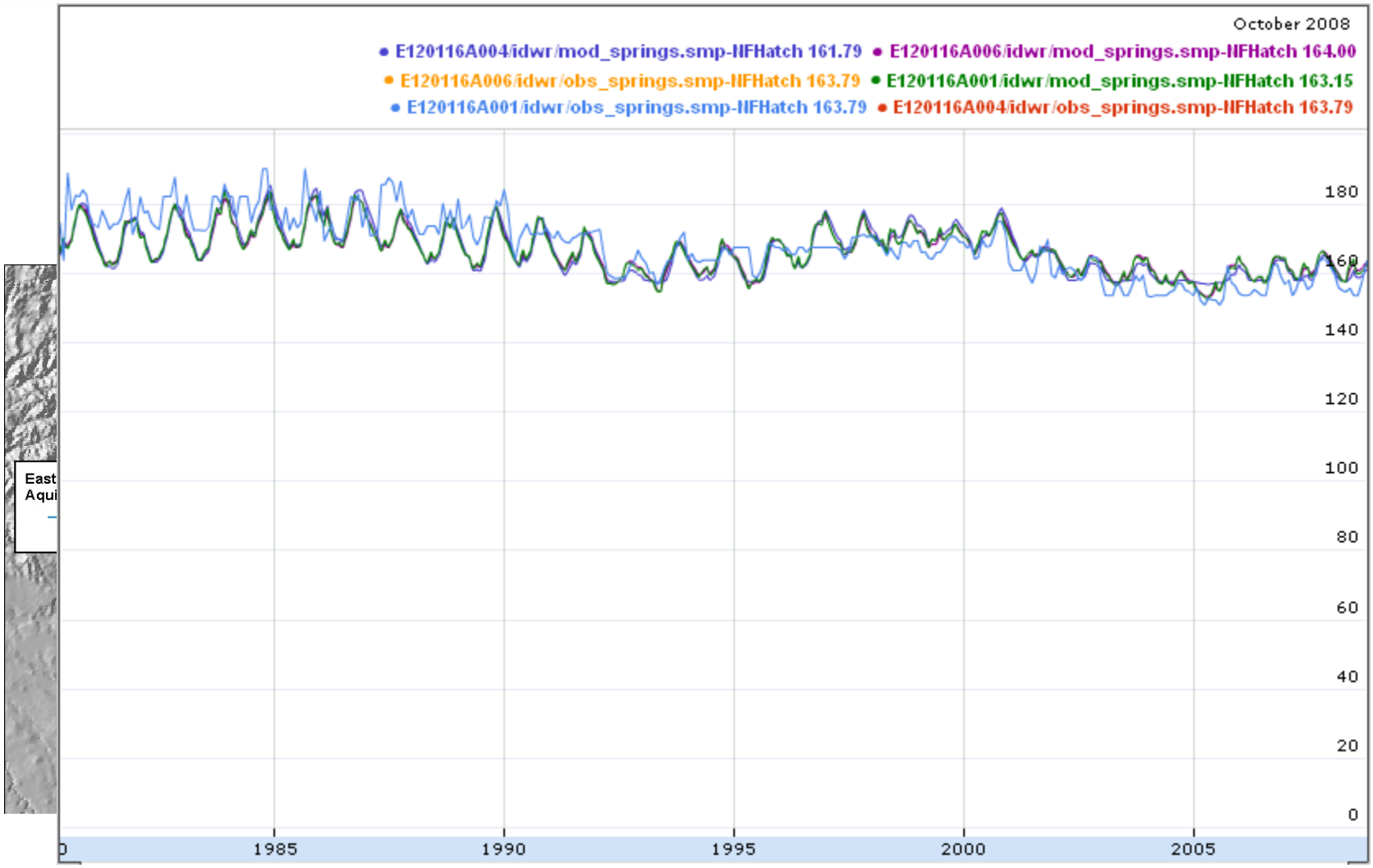


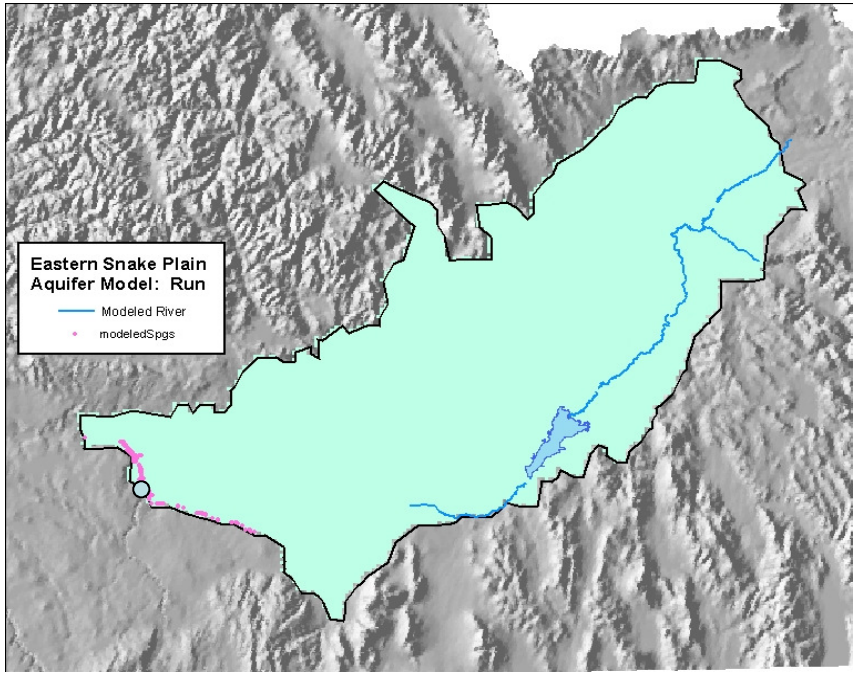
- Thousand Springs


November 1993
E120116A004/idwr/mod_springs.smp-kspgs 568.34
E120116A006/idwr/mod_springs.smp-kspgs 576.59
E120116A001/idwr/mod_springs.smp-kspgs 570.24
650
600
550
500
450
400
350
300
250
200
150
100
50
0
1985
1990
1995
2000
2005
East
Aqui

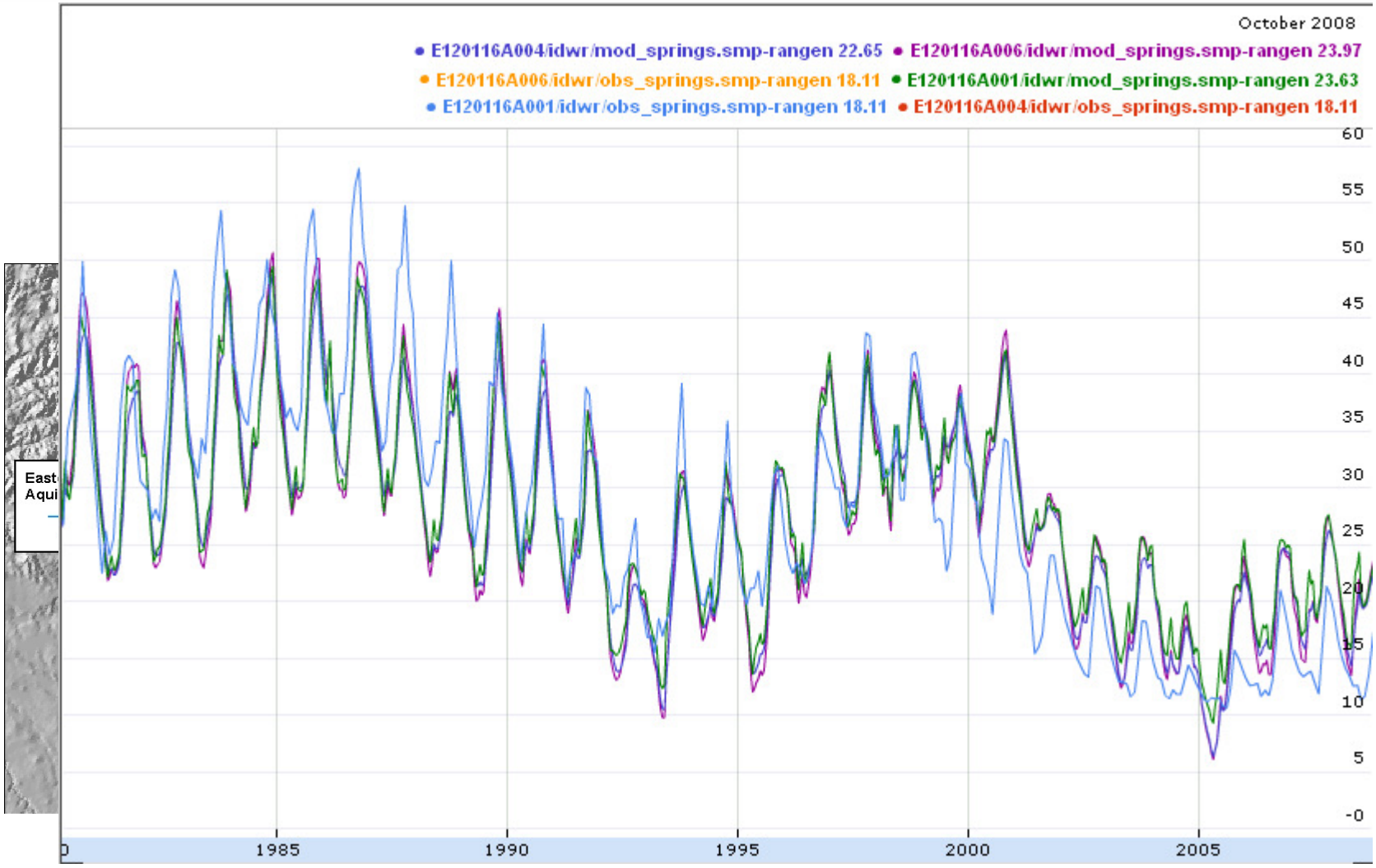


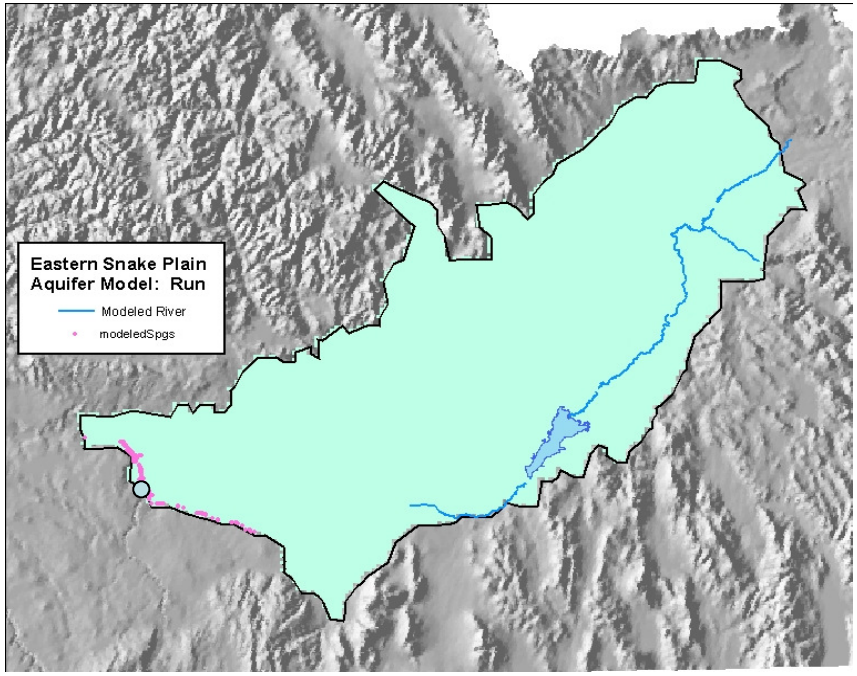
- Ntl Fish Hatchery


October 2008
E120116A004/idwr/mod_springs.smp-NFHatch 161.79
E120116A006/idwr/mod_springs.smp-NFHatch 164.00
E120116A006/idwr/obs_springs.smp-NFHatch 163.79
E120116A001/idwr/mod_springs.smp-NFHatch 163.15
E120116A001/idwr/obs_springs.smp-NFHatch 163.79
E120116A004/idwr/obs_springs.smp-NFHatch 163.79
180
160
140
120
100
80
60
40
20
0
1985
1990
1995
2000
2005
East
Aqui

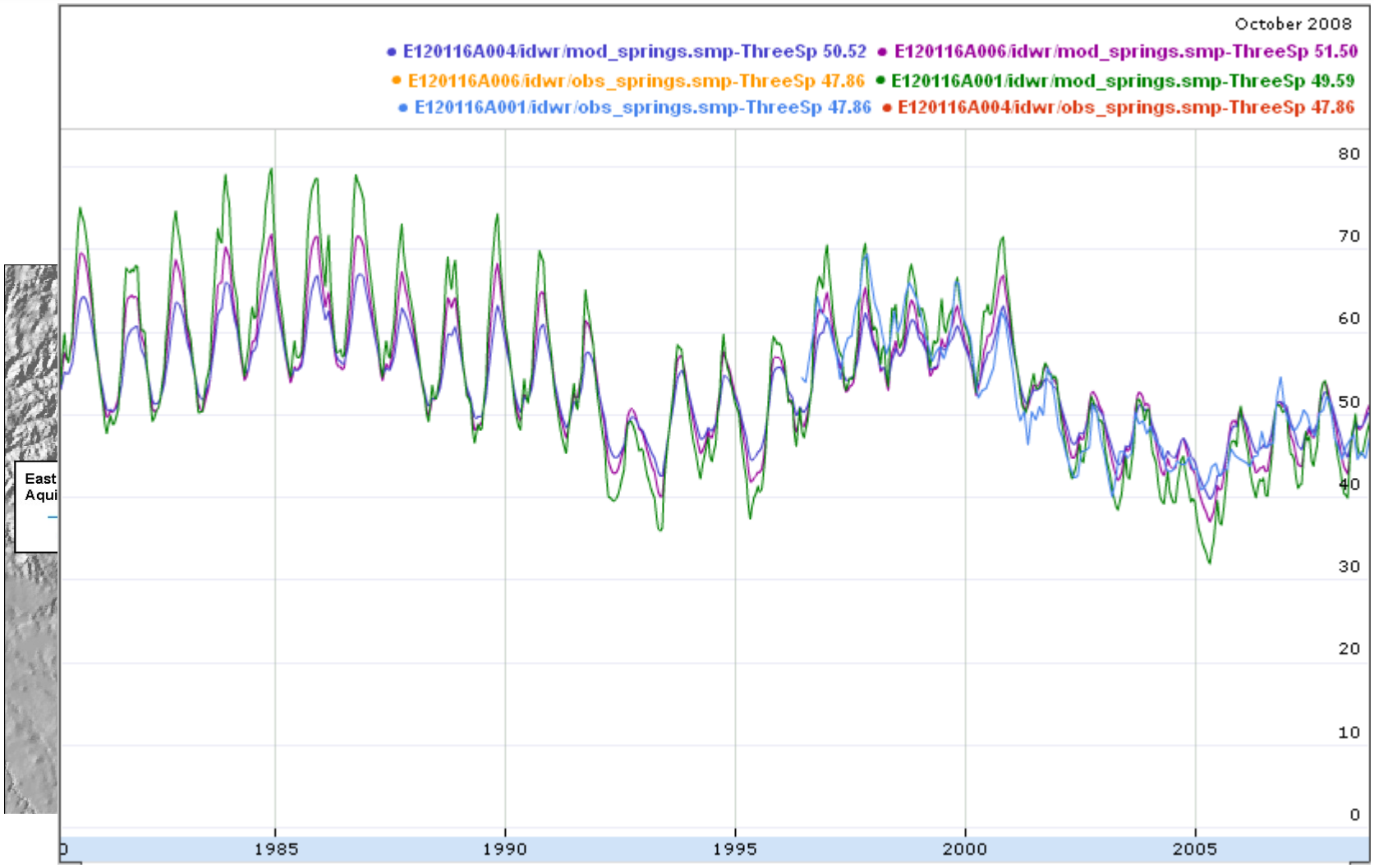


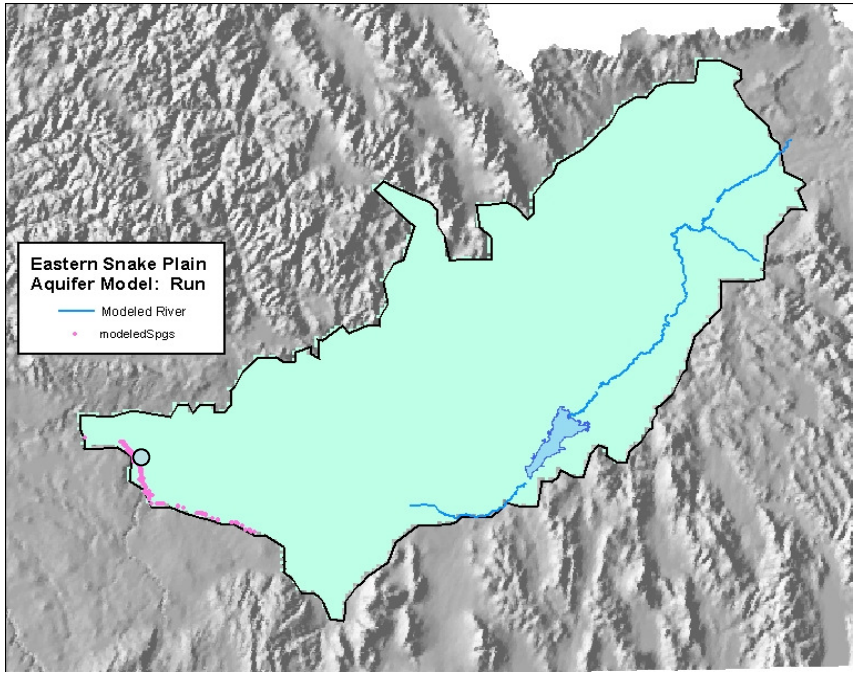
- Rangen Spring


October 2008
E120116A004/idwr/mod_springs.smp-rangen 22.65
E120116A006/idwr/mod_springs.smp-rangen 23.97
E120116A006/idwr/obs_springs.smp-rangen 18.11
E120116A001/idwr/mod_springs.smp-rangen 23.63
E120116A001/idwr/obs_springs.smp-rangen 18.11
E120116A004/idwr/obs_springs.smp-rangen 18.11
60
55
50
45
40
35
30
25
20
15
10
5
-0
1985
1990
1995
2000
2005

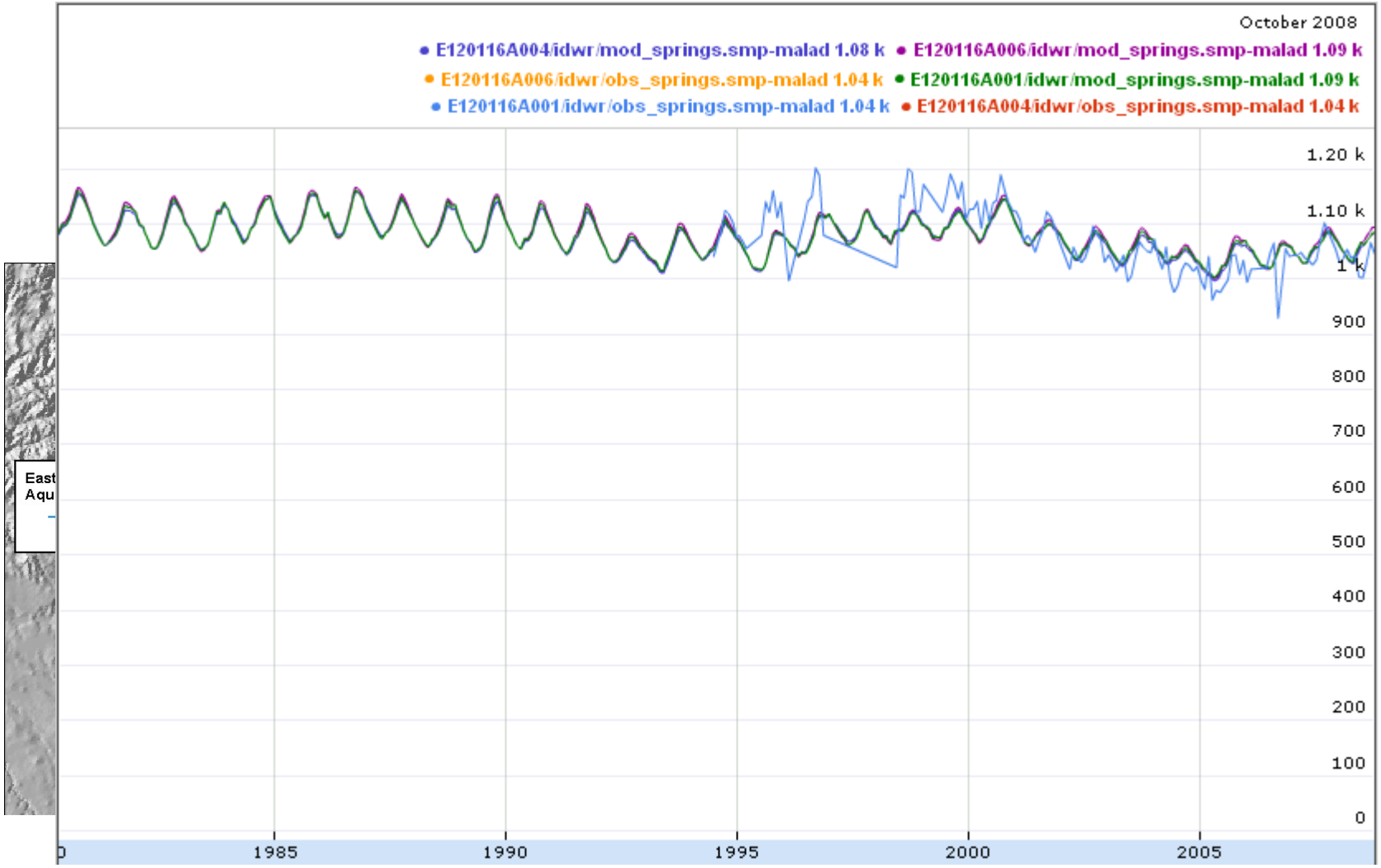


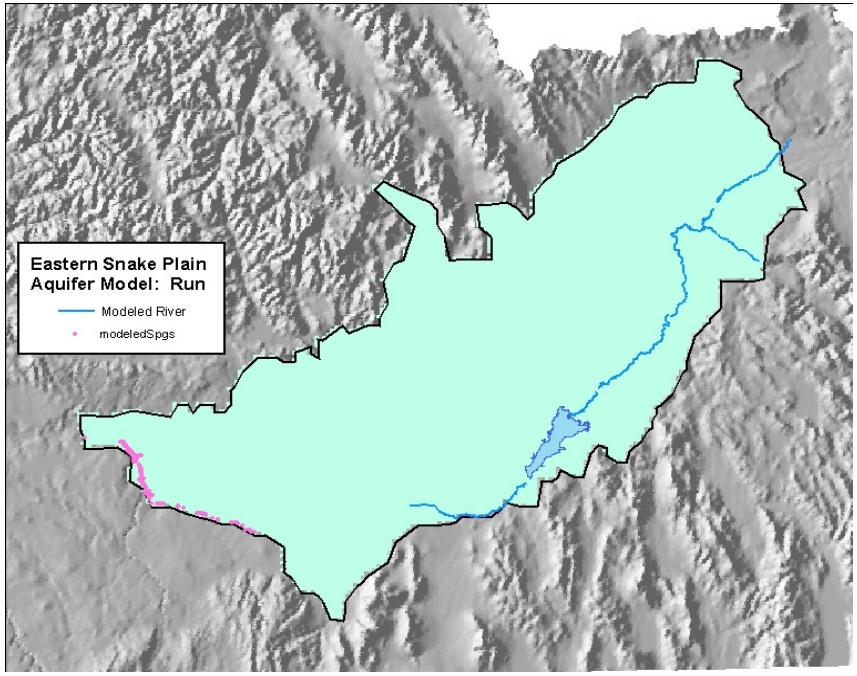
- Three Springs


October 2008
E120116A004/idwr/mod_springs.smp-ThreeSp 50.52
E120116A006/idwr/mod_springs.smp-ThreeSp 51.50
E120116A006/idwr/obs_springs.smp-ThreeSp 47.86
E120116A001/idwr/mod_springs.smp-ThreeSp 49.59
E120116A001/idwr/obs_springs.smp-ThreeSp 47.86
E120116A004/idwr/obs_springs.smp-ThreeSp 47.86
80
70
60
50
40
30
20
10
0
1985
1990
1995
2000
2005
East
Aqui


Eastern Snake Plain
Aquifer Model: Run
Modeled River
modeledSpgs

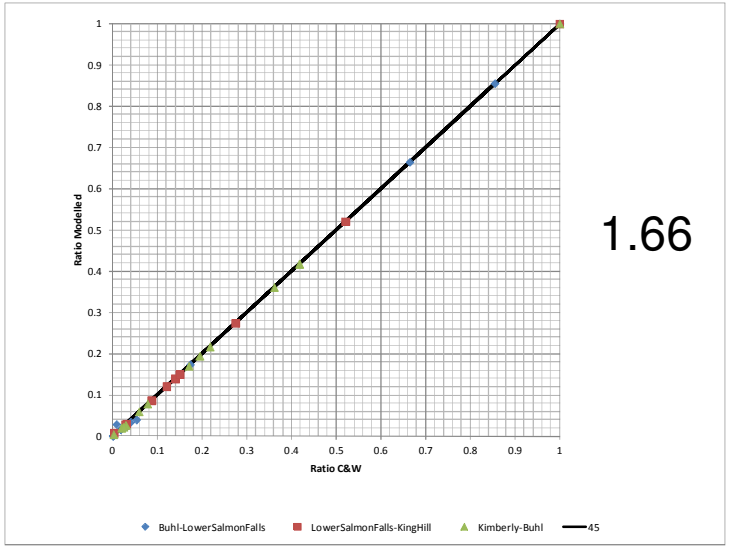
- Malad


October 2008
E120116A004/idwr/mod_springs.smp-malad 1.08 k
E120116A006/idwr/mod_springs.smp-malad 1.09 k
E120116A006/idwr/obs_springs.smp-malad 1.04 k
E120116A001/idwr/mod_springs.smp-malad 1.09 k
E120116A001/idwr/obs_springs.smp-malad 1.04 k
E120116A004/idwr/obs_springs.smp-malad 1.04 k
1.20 k
1.10 k
1 k
900
800
700
600
500
400
300
200
100
0
1985
1990
1995
2000
2005



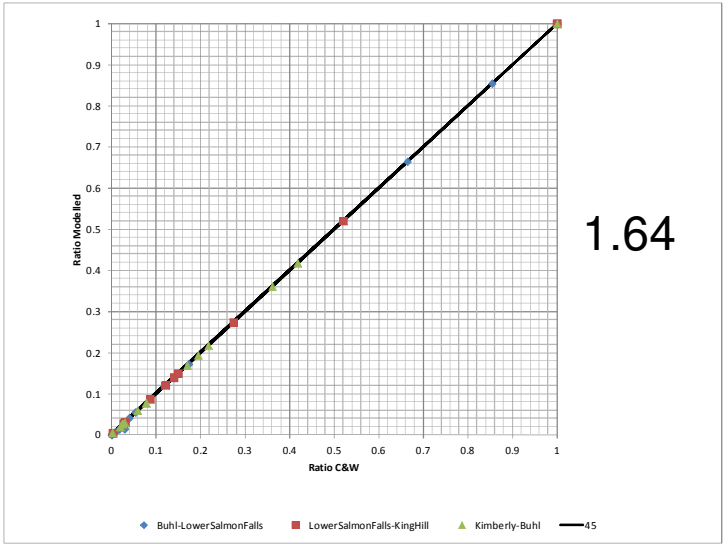
- Group C Springs

001



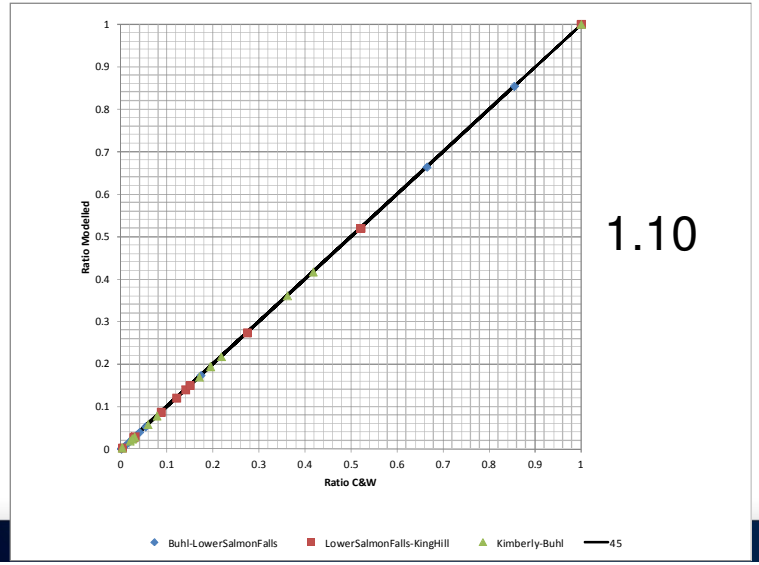
1.66

004



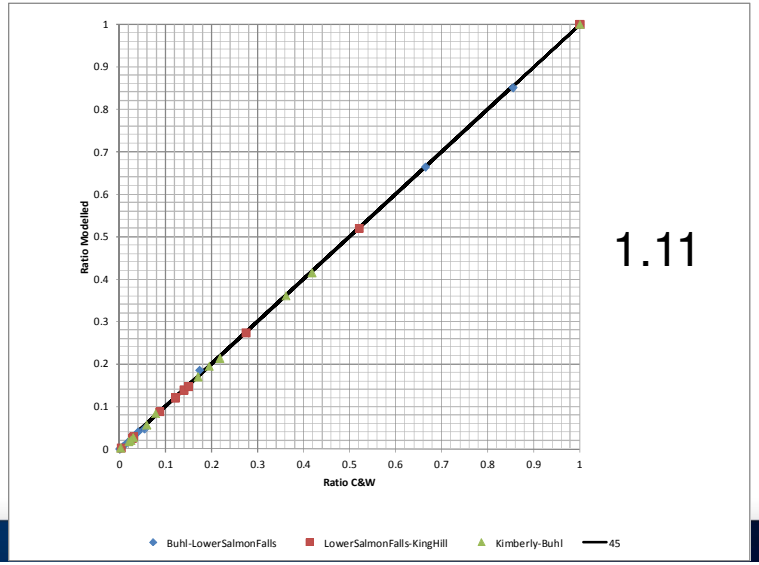
1.64

006

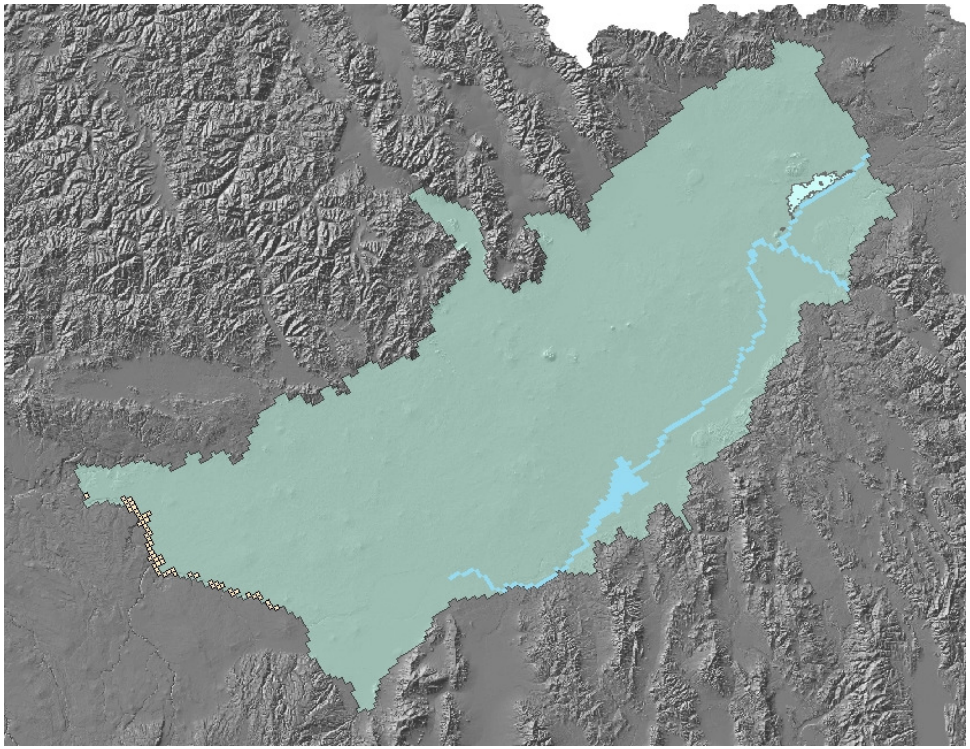


1.10

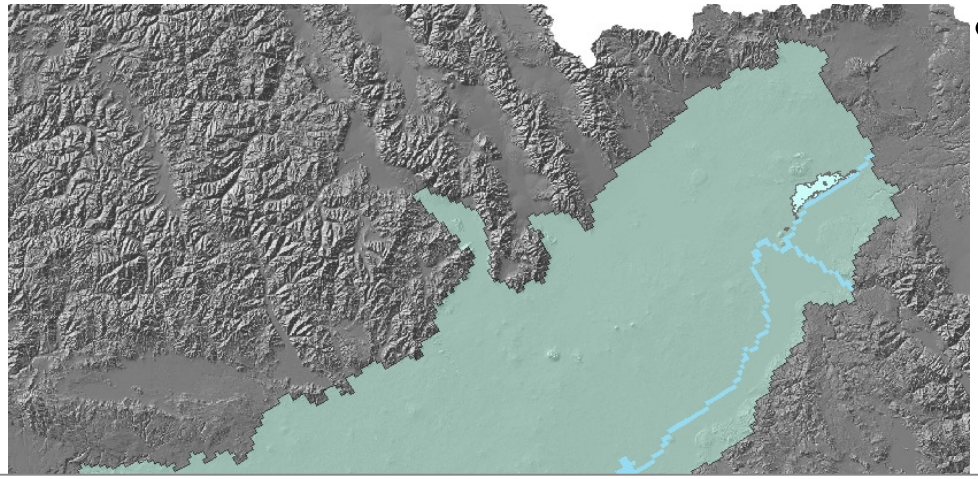
007



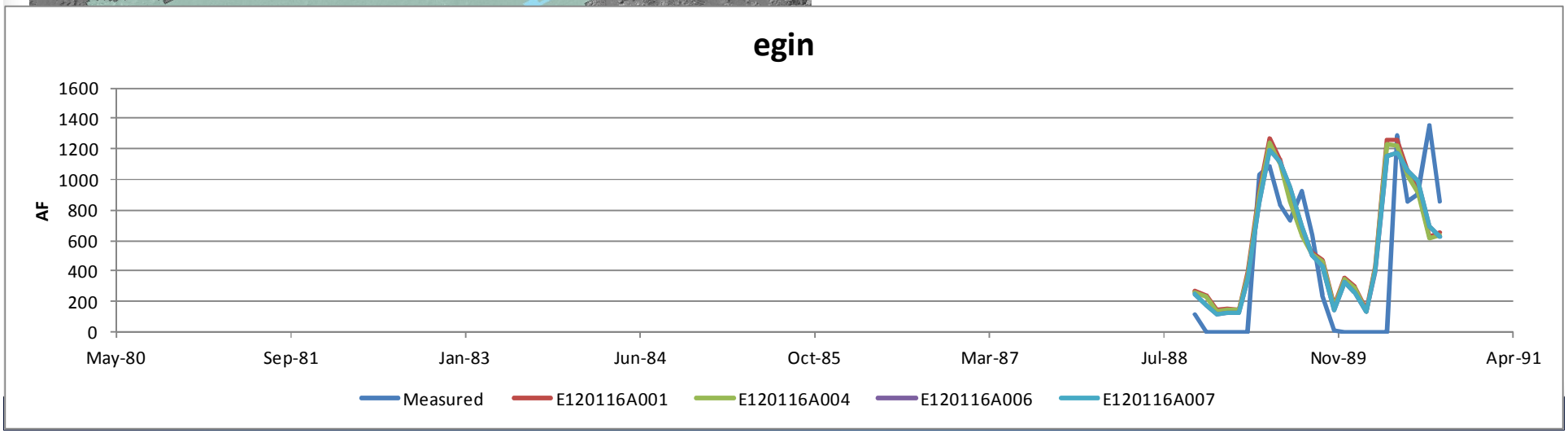
1.11

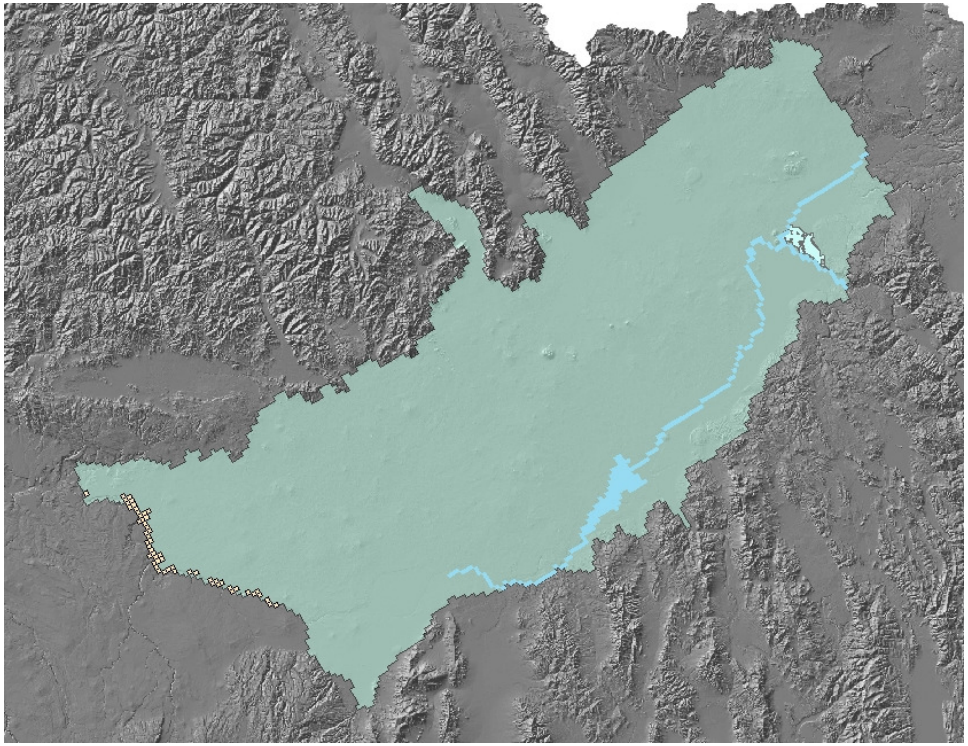


- Egin returns

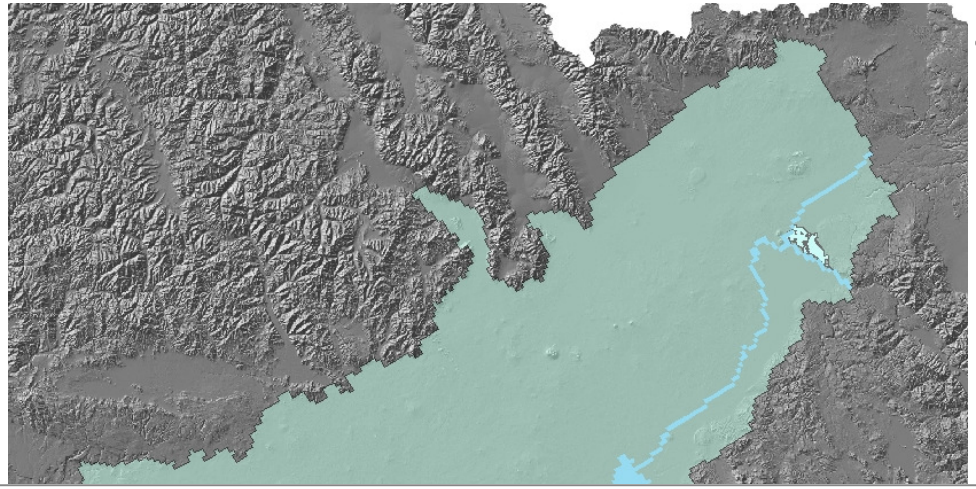


- Egin returns

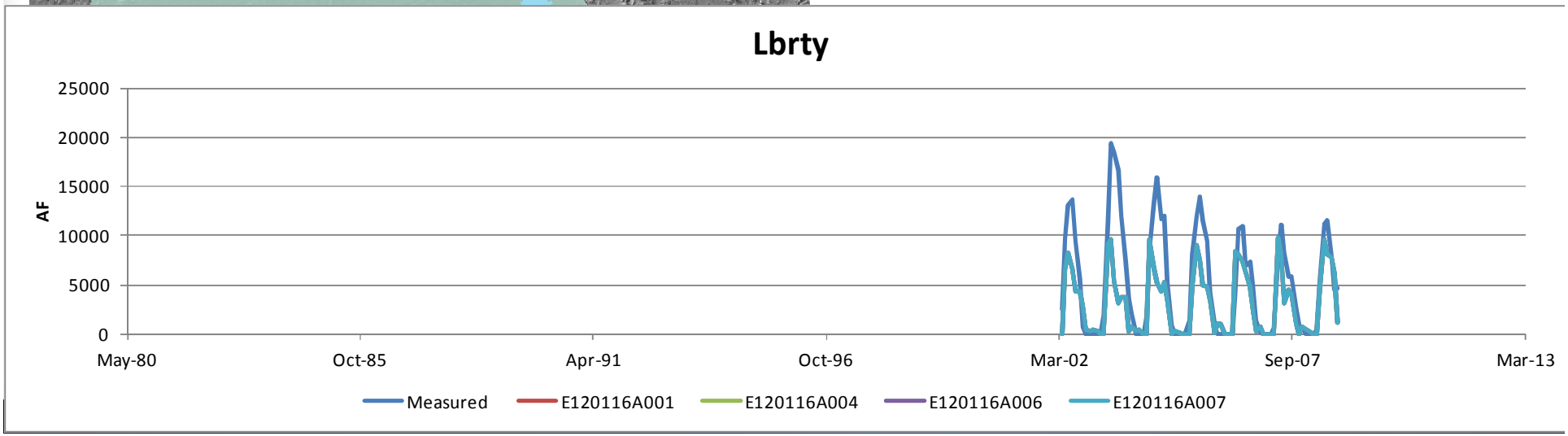


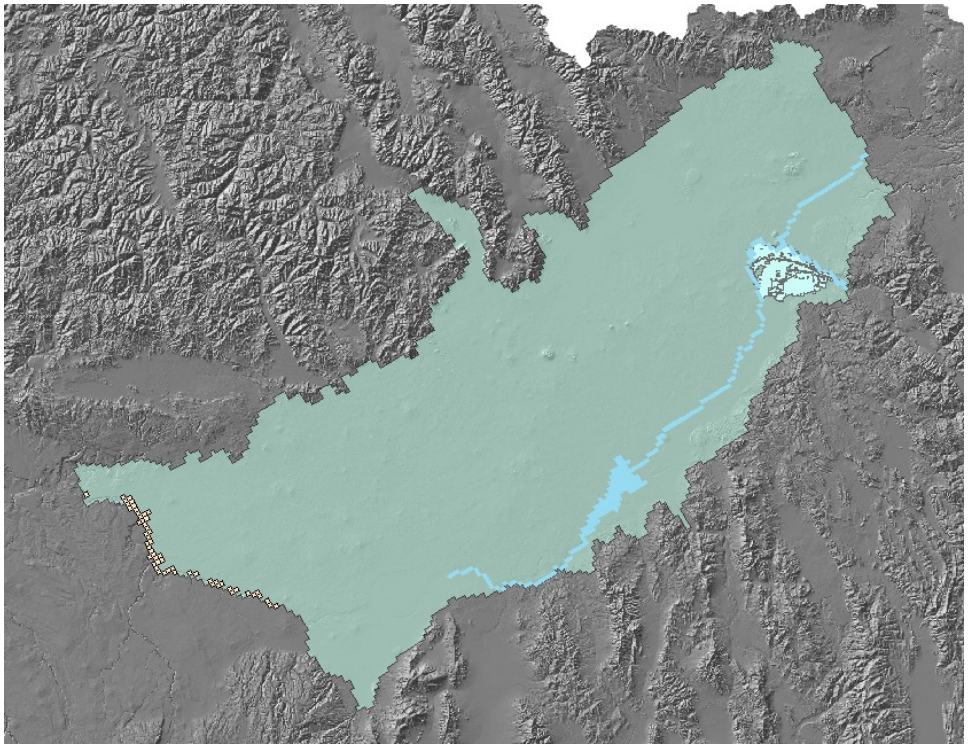


- Liberty returns

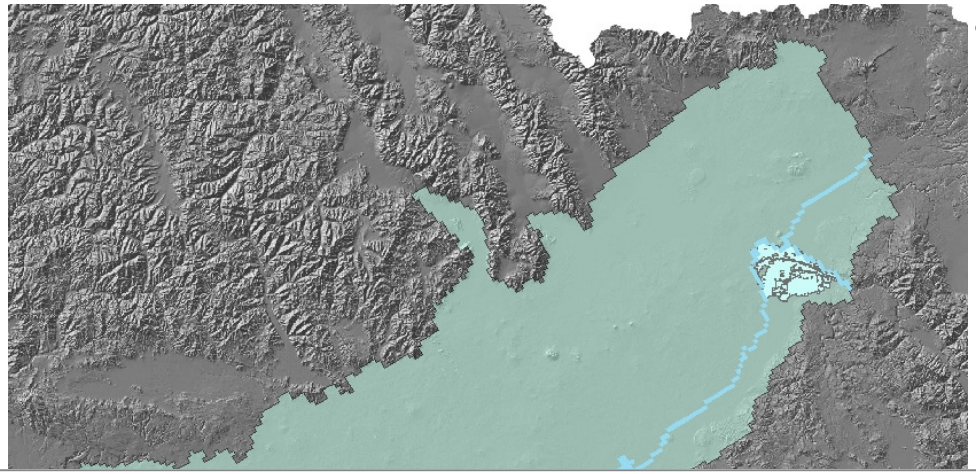


- Liberty returns

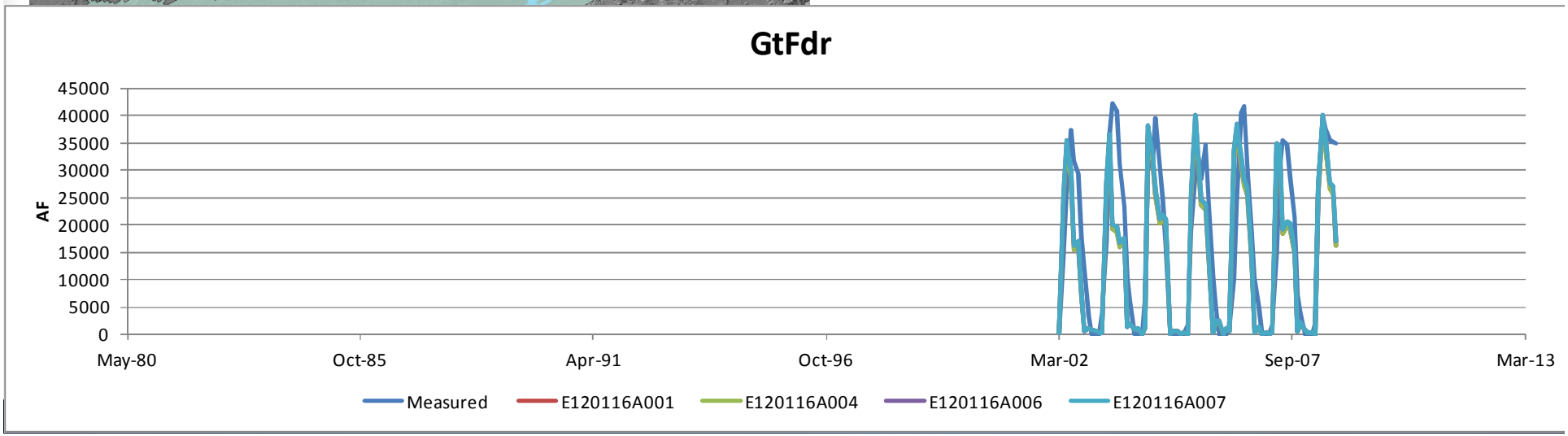


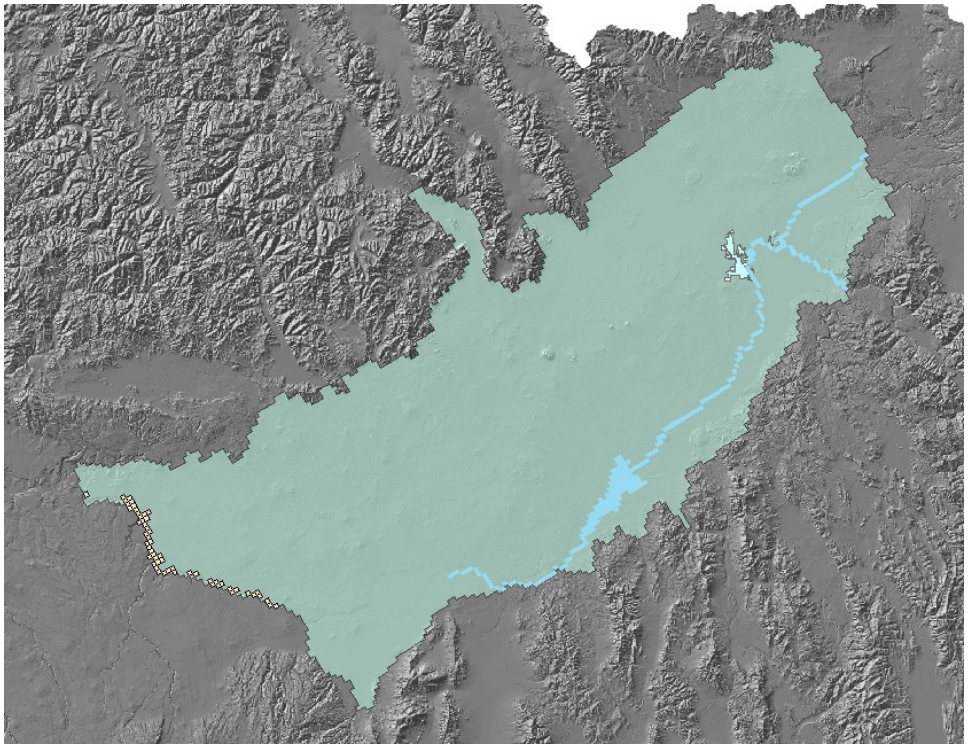


- Great Feeder Group returns

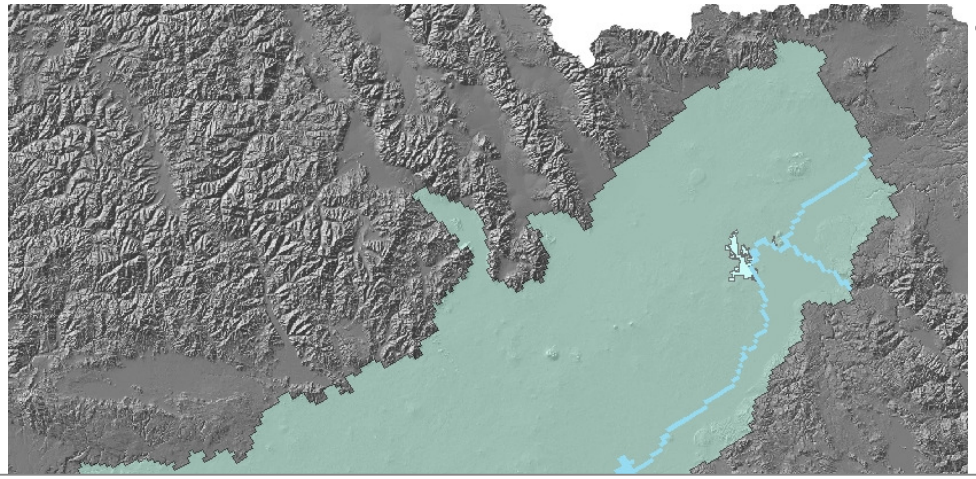


- Great Feeder Group returns

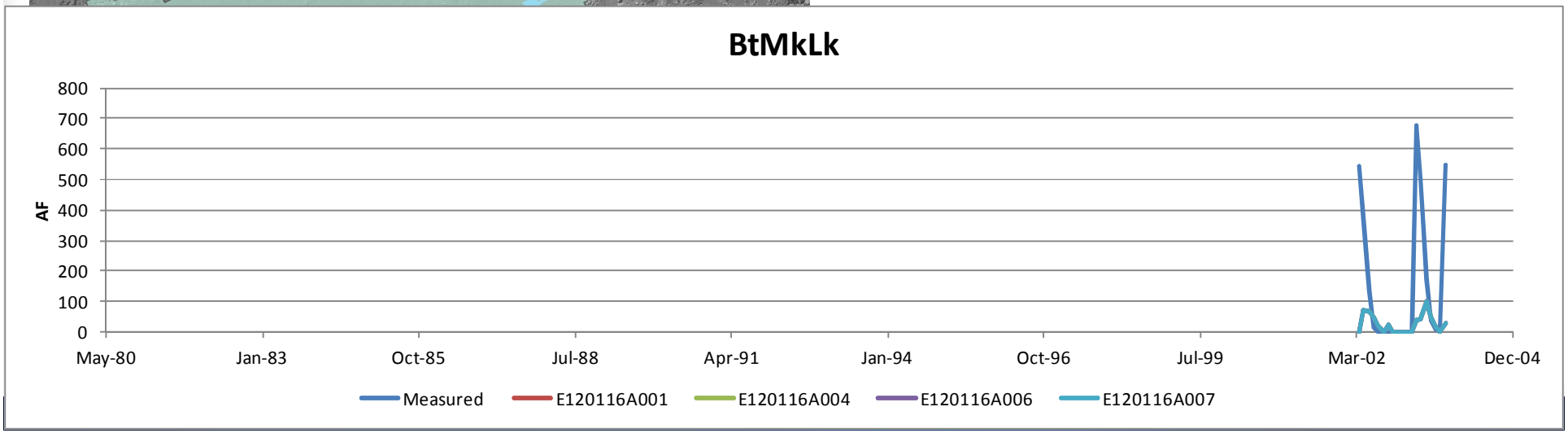


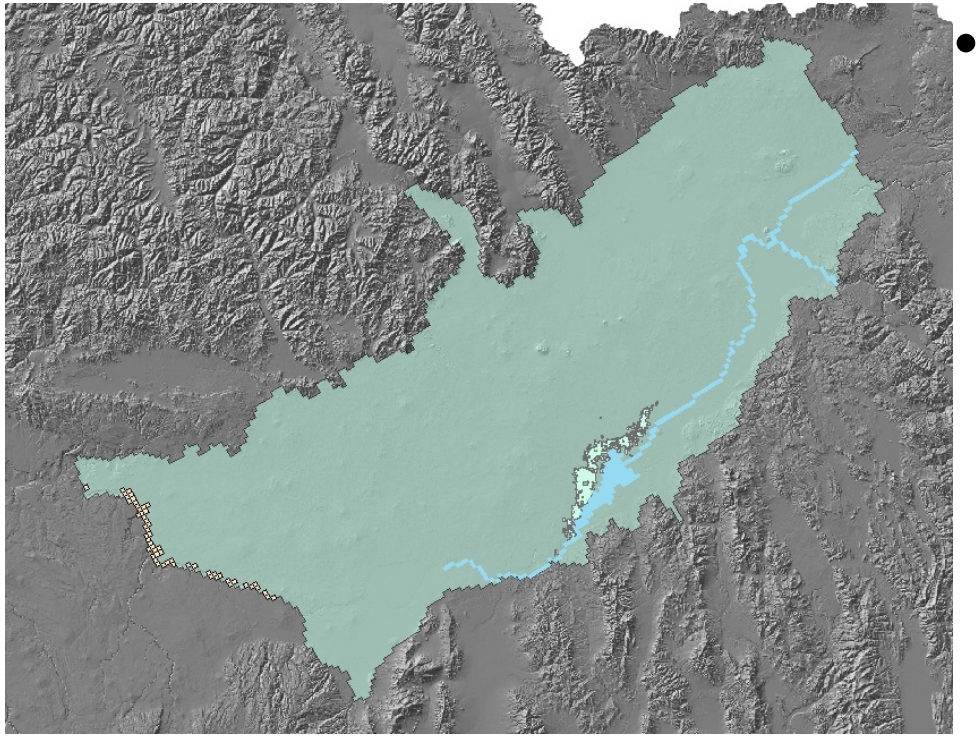


- Butte-Market Lake returns

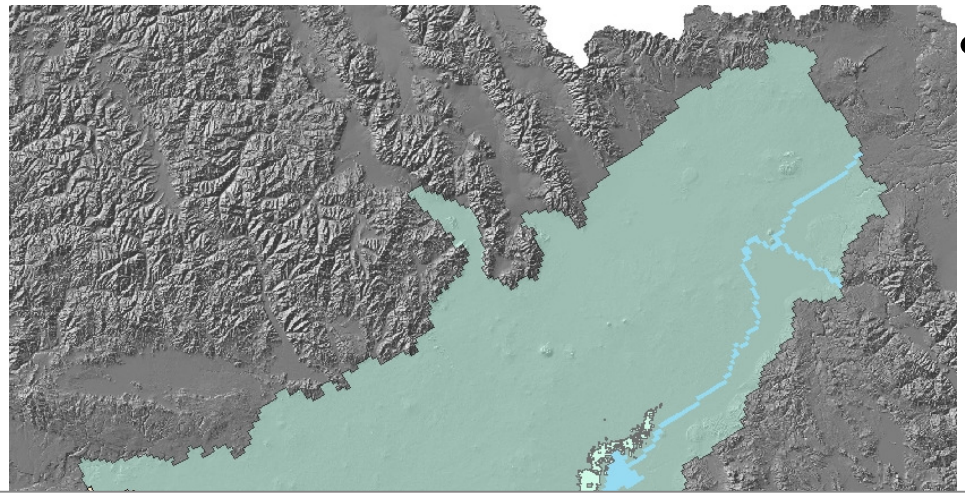


- Butte-Market Lake returns

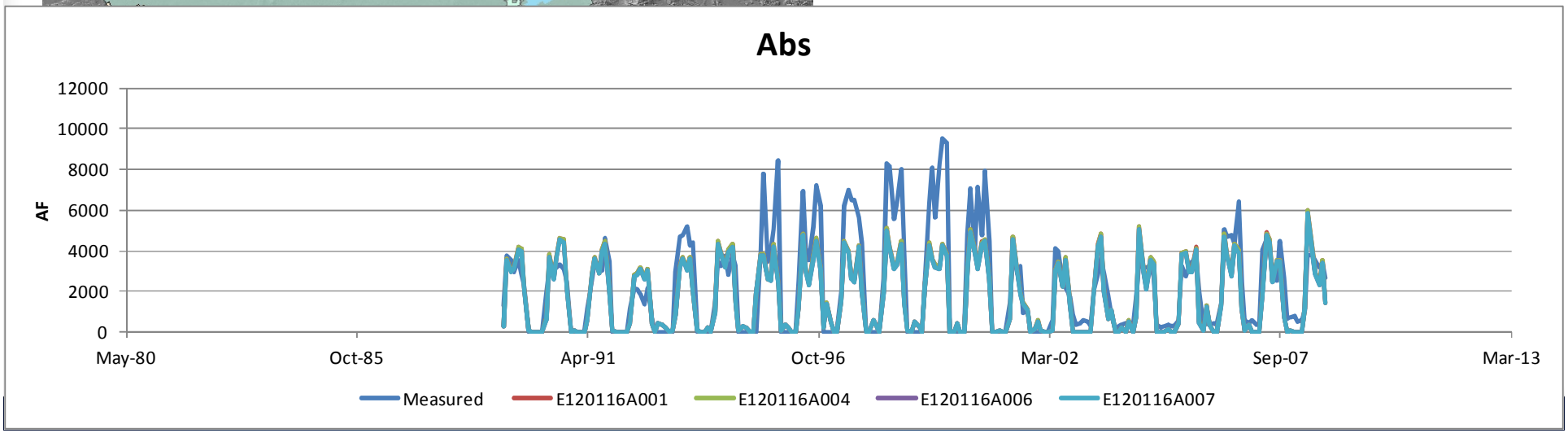


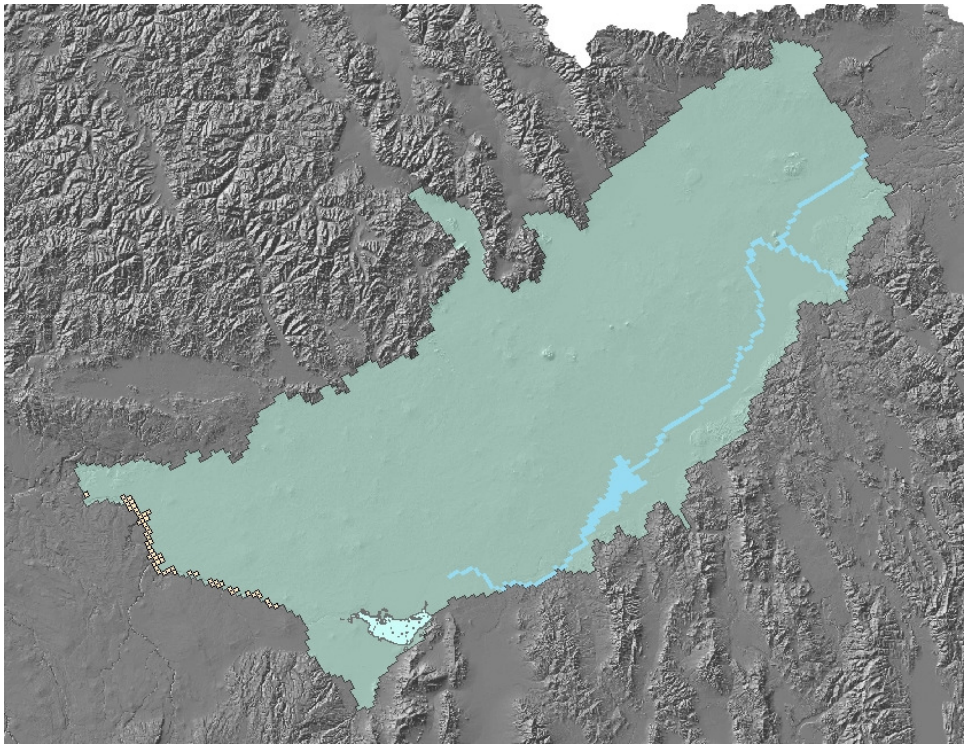


- Aberdeen-Springfield returns

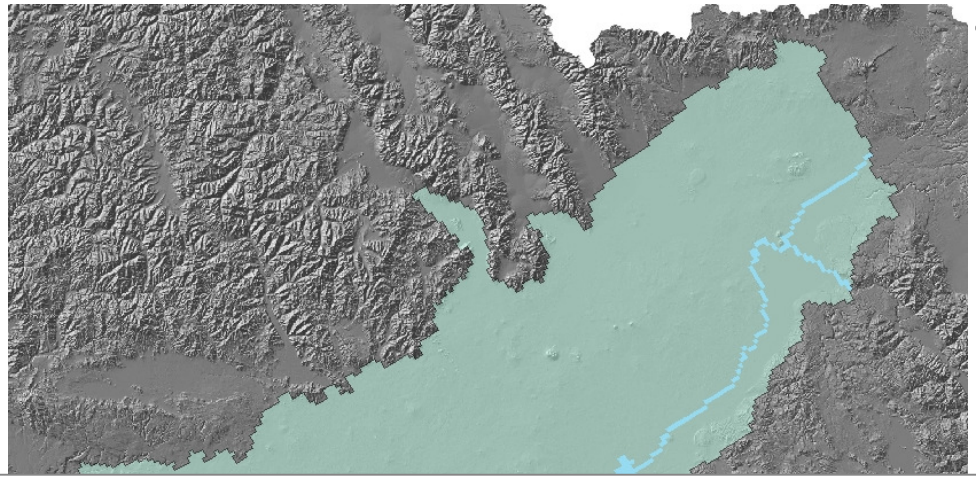


- Aberdeen-Springfield returns

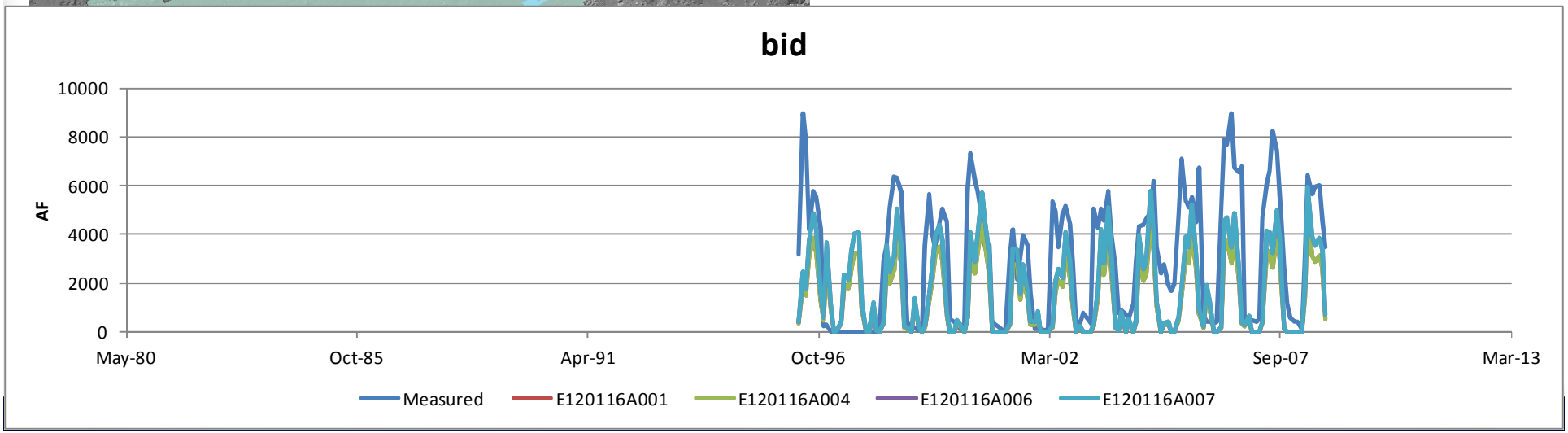


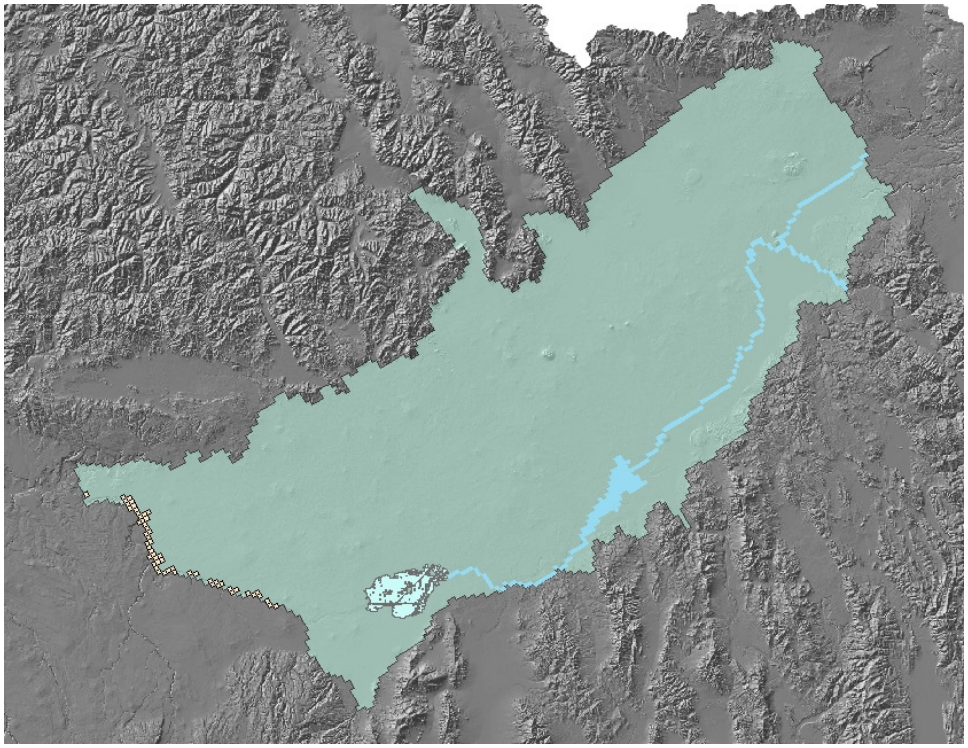


- Burley Irrigation District returns

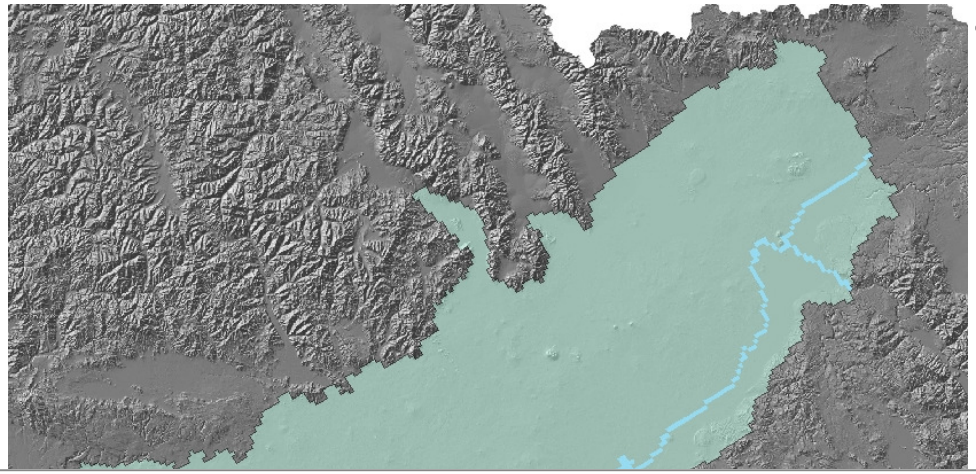


- Burley Irrigation District returns

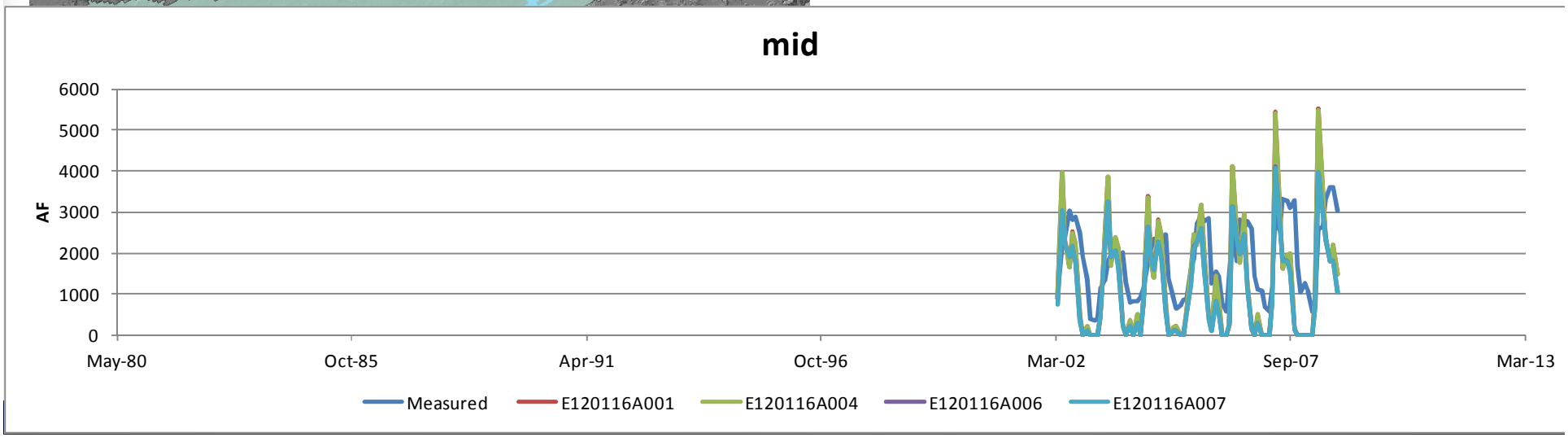


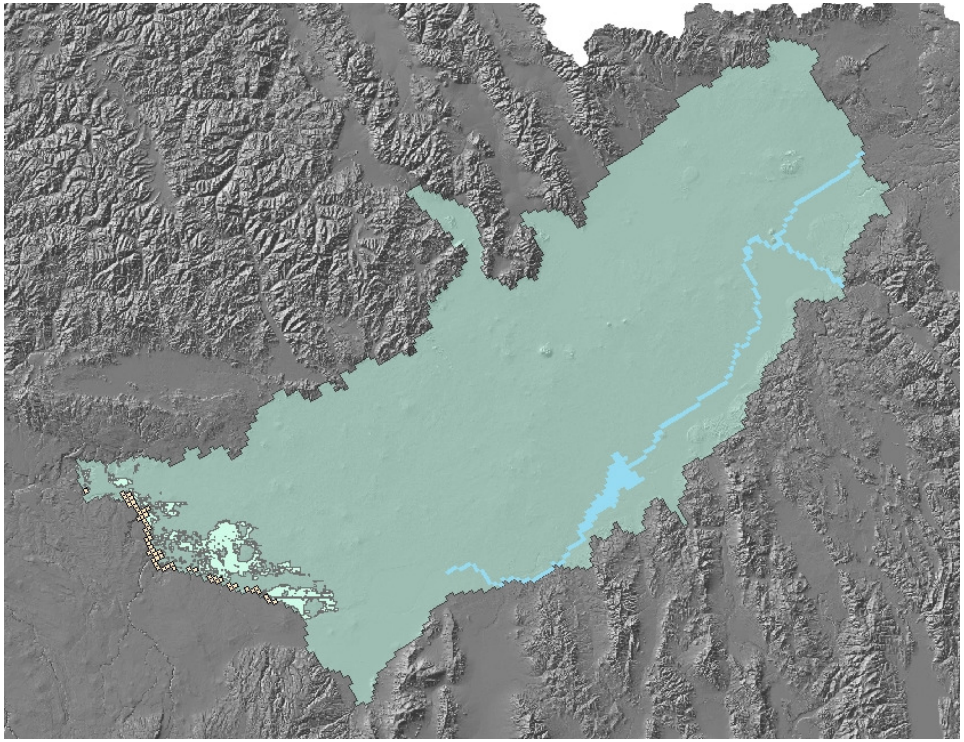


- Minidoka Irrigation District returns

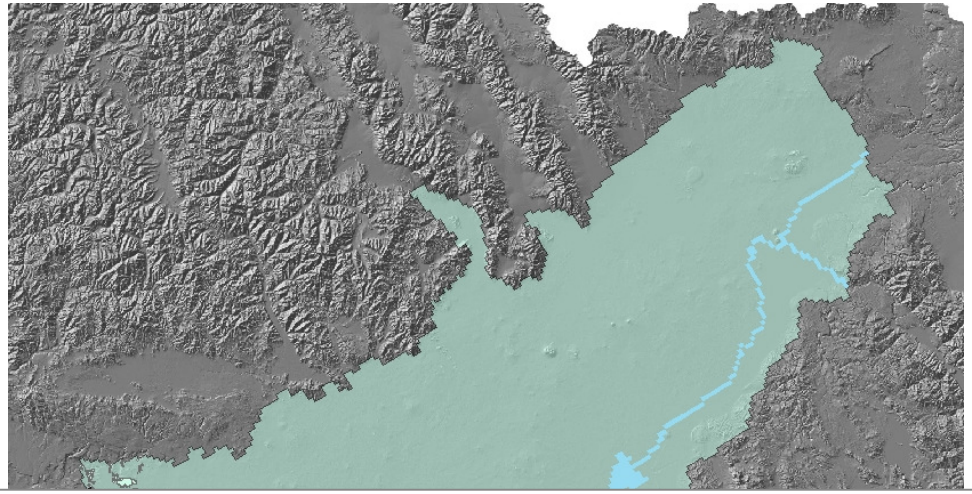


- Minidoka Irrigation District returns

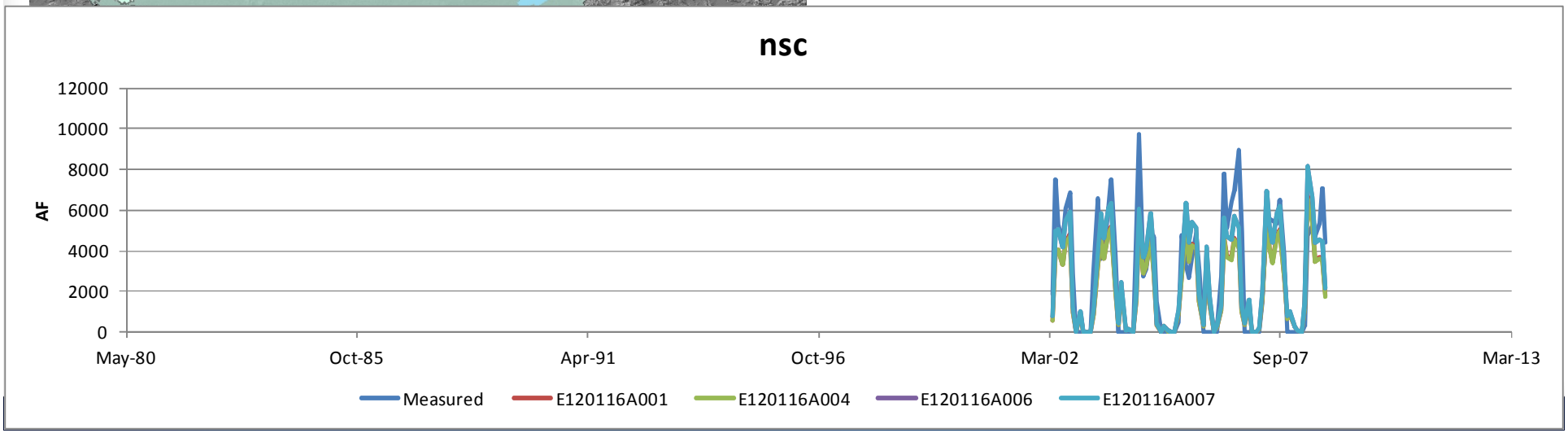




- North Side Canal Co returns



- North Side Canal Co returns



END