Calibration with A,B, & C Springs using E101027A with Return Flow Targets

Allan Wylie IDWR

2008 Reach Gain and Spring Discharge Targets

- Monthly Stress Periods
  - Using
    - MKMOD5.exe
      - Using On-Farm algorithm
    - E101027A
      - Assumes that the On-Farm algorithm would be used
    - No steady state targets
    - Aquifer head
      - 1985-2008
        - » New
    - 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
      - NSCCo and Aberdeen-Springfield

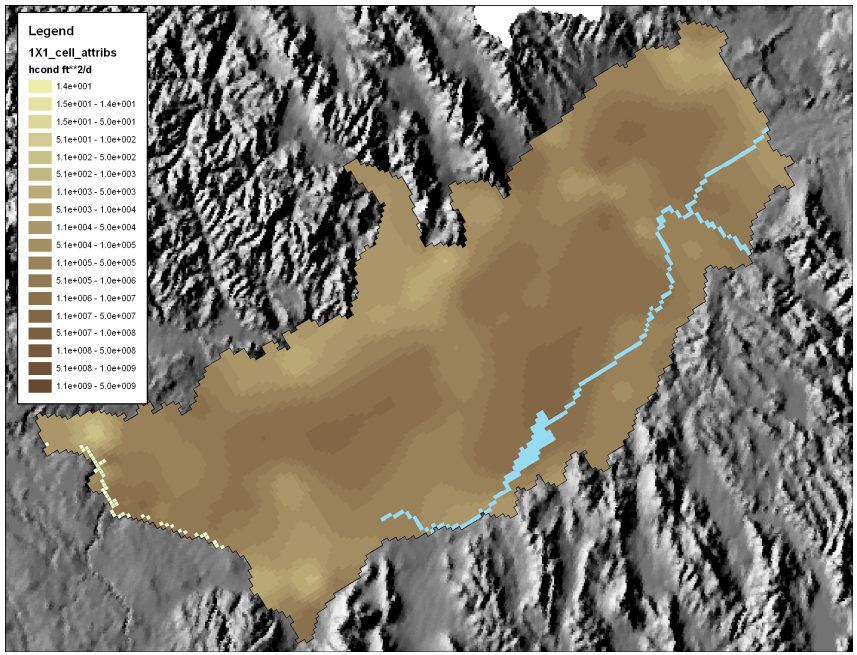
2008 Reach Gain and Spring Discharge Targets

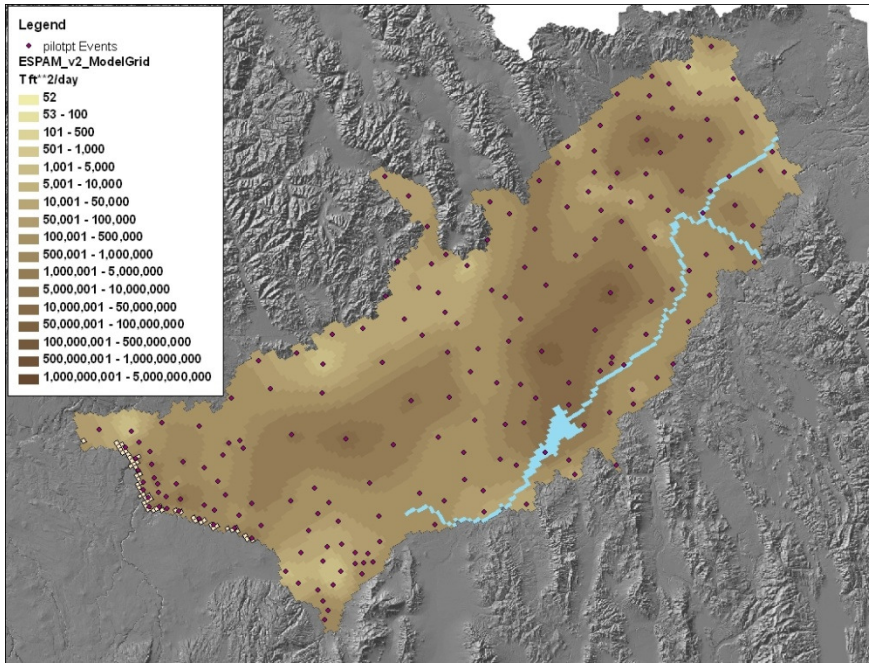
- Adjustable Parameters
  - Transmissivity
    - Pilot Points
      - 1e-10 – 1e+10
  - Specific Yield
    - Pilot Points
      - 0.001 – 0.30
  - Riverbed Conductance
    - By reach
      - 1.0 – 1e+10
  - Drain Conductance
    - By drain cell
      - Up to 3 drain cells per model cell
      - 1e-10 - 3e+8
  - Canal seepage
    - Uniform by entity
      - 1.05 – 0.95
  - Non-irrigated recharge
    - Thin Thick and Lava
    - 2.0 – 1.0e-6
  - ET
    - Surface Water Entity
      - Sprinkler and Gravity
      - +/-5%
    - Groundwater Entity
      - Sprinkler and Gravity
      - +/-5%
  - Perched River Seepage
    - River reach
    - +/-20%
  - Tributary Underflow
    - Tributary Basin
    - 2 – 0.5

2008 Reach Gain and Spring Discharge Targets

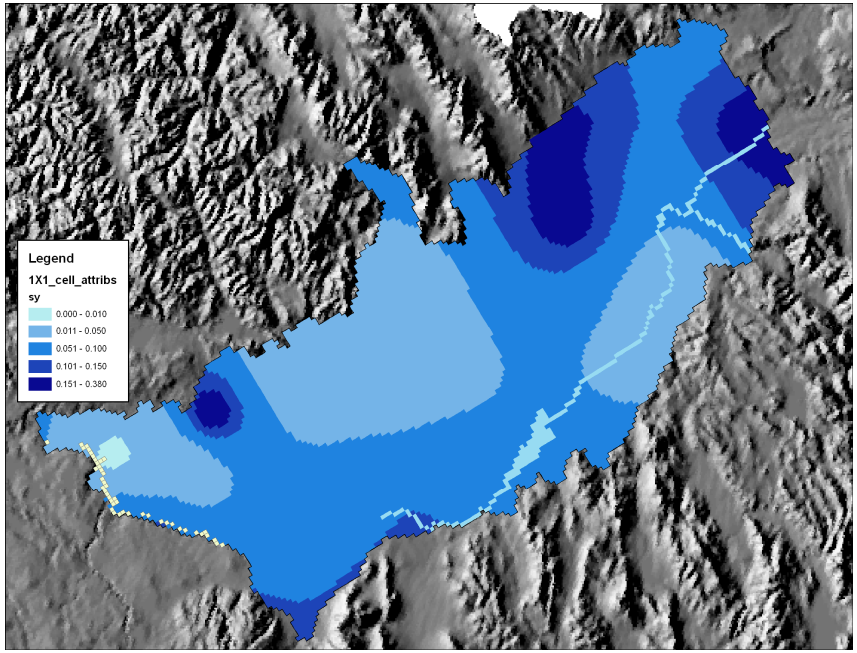
- Adjustable Parameters (cont)
  - On Farm Parameters
    - EffSp
      - Fixed 0.85
    - EffGr
      - Fixed 0.8
    - DPin
      - 0.98 – 0.6
    - DPex
      - 0.98 – 0.6
      - Entities with no returns DPex fixed at 1.0

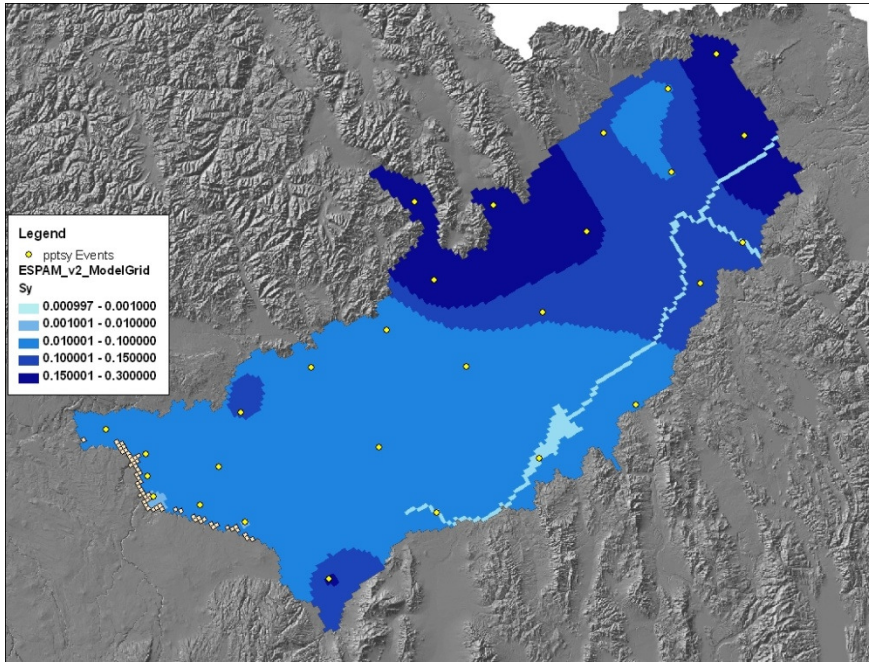
V 1.1


Legend
1X1_cell_attribs
hcond ft**2/d
1.4e+001
1.5e+001 - 1.4e+001
1.5e+001 - 5.0e+001
5.1e+001 - 1.0e+002
1.1e+002 - 5.0e+002
5.1e+002 - 1.0e+003
1.1e+003 - 5.0e+003
5.1e+003 - 1.0e+004
1.1e+004 - 5.0e+004
5.1e+004 - 1.0e+005
1.1e+005 - 5.0e+005
5.1e+005 - 1.0e+006
1.1e+006 - 1.0e+007
1.1e+007 - 5.0e+007
5.1e+007 - 1.0e+008
1.1e+008 - 5.0e+008
5.1e+008 - 1.0e+009
1.1e+009 - 5.0e+009

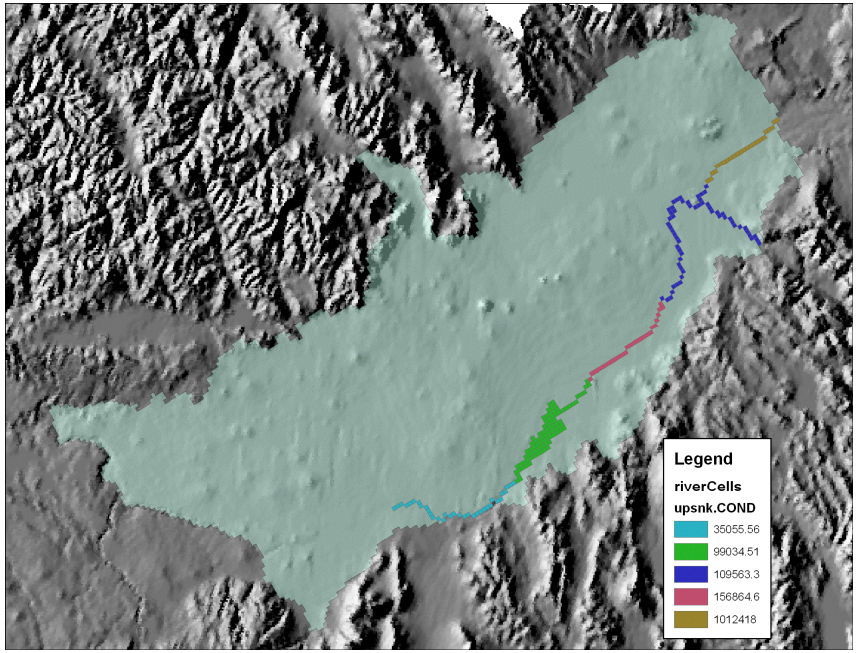

Legend
pilotpt Events
ESPAM_v2_ModelGrid
T ft**2/day
52
53 - 100
101 - 500
501 - 1,000
1,001 - 5,000
5,001 - 10,000
10,001 - 50,000
50,001 - 100,000
100,001 - 500,000
500,001 - 1,000,000
1,000,001 - 5,000,000
5,000,001 - 10,000,000
10,000,001 - 50,000,000
50,000,001 - 100,000,000
100,000,001 - 500,000,000
500,000,001 - 1,000,000,000
1,000,000,001 - 5,000,000,000

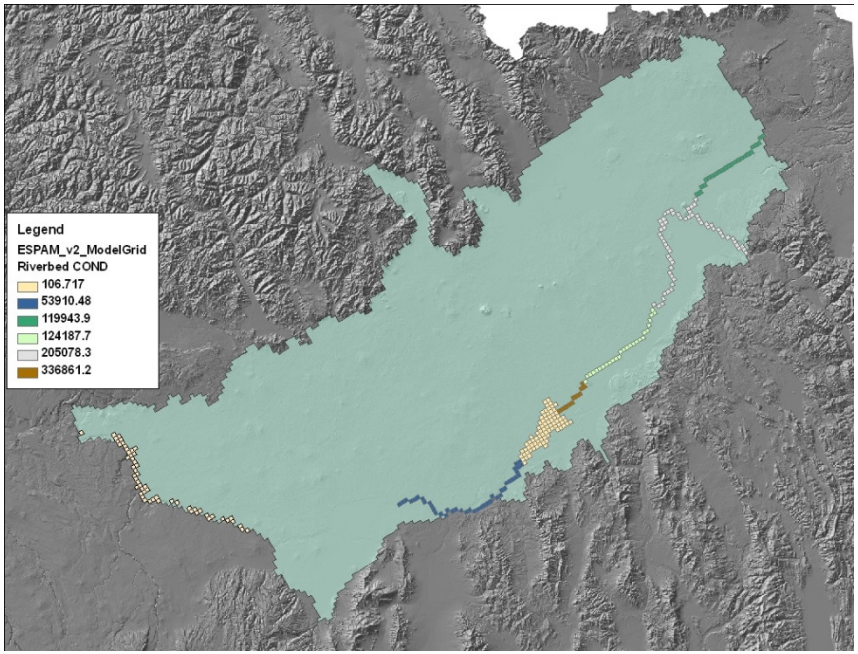
V 1.1


Legend
1X1_cell_attribs
sy
0.000 - 0.010
0.011 - 0.050
0.051 - 0.100
0.101 - 0.150
0.151 - 0.380

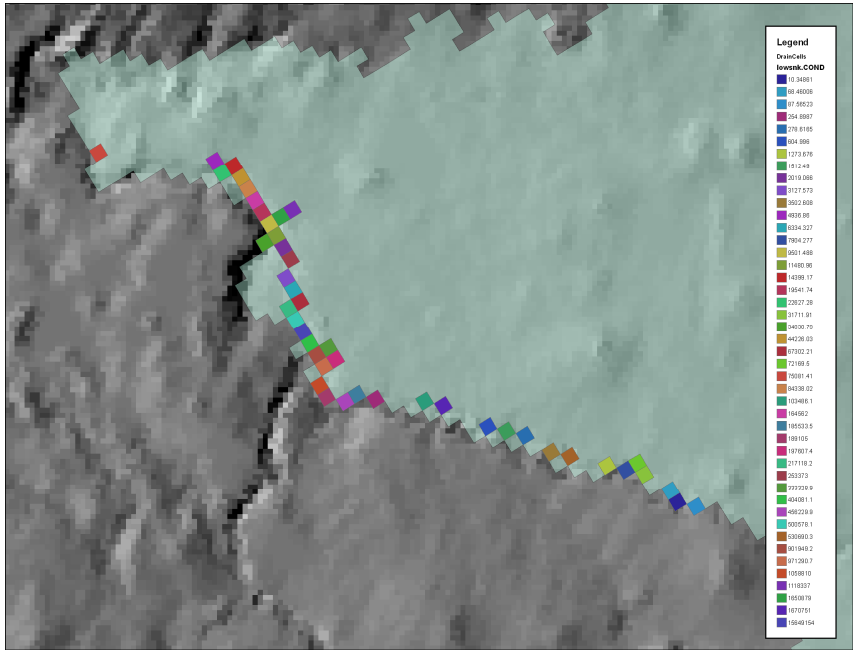

Legend
pptsy Events
ESPAM_v2_ModelGrid
Sy
0.000997 - 0.001000
0.001001 - 0.010000
0.010001 - 0.100000
0.100001 - 0.150000
0.150001 - 0.300000

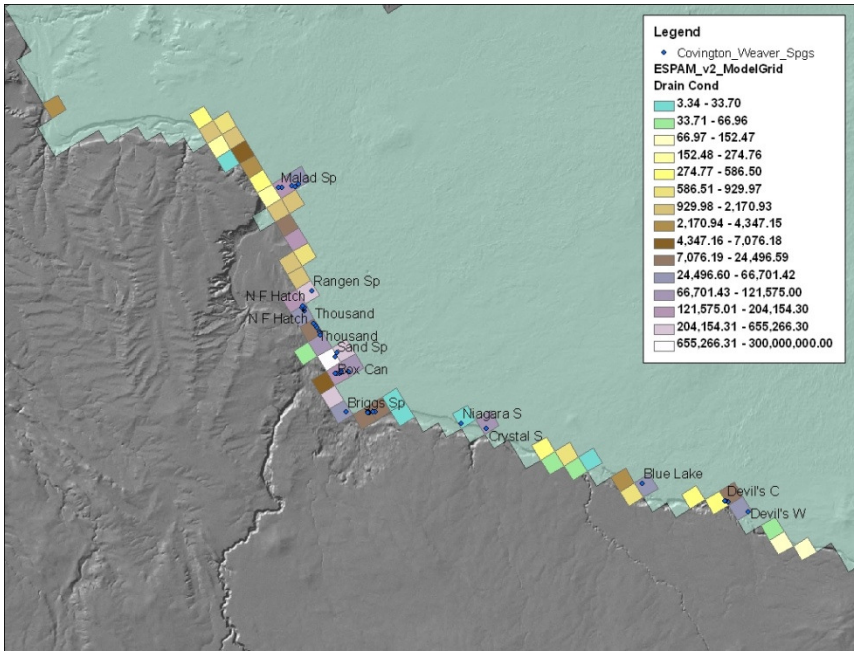
V 1.1


Legend
riverCells
upsnk.COND
35055.56
99034.51
109563.3
156864.6
1012418

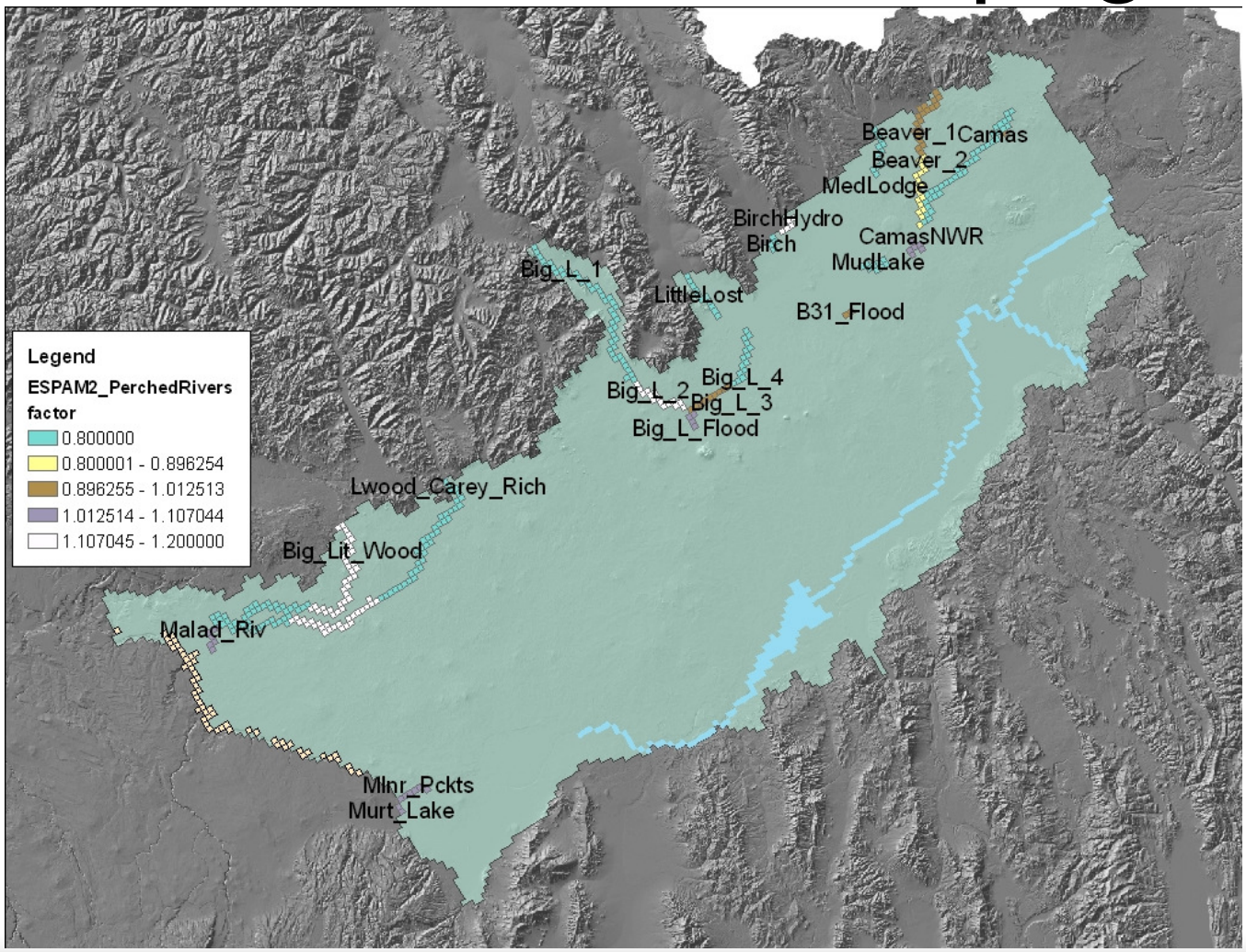

Legend
ESPAM_v2_ModelGrid
Riverbed COND
106.717
53910.48
119943.9
124187.7
205078.3
336861.2

V 1.1

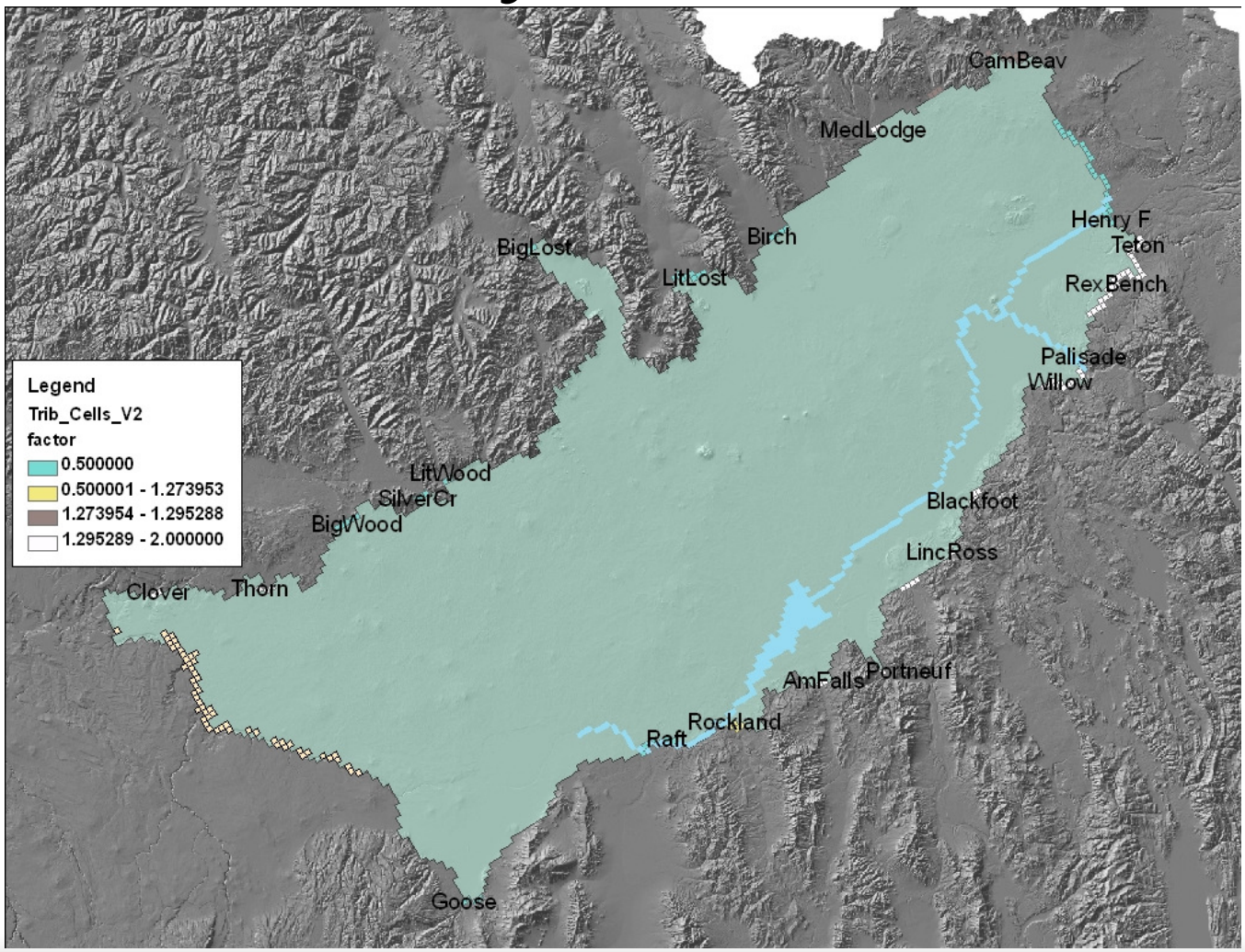

Legend
DrainCells
lowsnk.COND


Legend
Covington_Weaver_Spgs
ESPAM_v2_ModelGrid
Drain Cond
3.34 - 33.70
33.71 - 66.96
66.97 - 152.47
152.48 - 274.76
274.77 - 586.50
586.51 - 929.97
929.98 - 2,170.93
2,170.94 - 4,347.15
4,347.16 - 7,076.18
7,076.19 - 24,496.59
24,496.60 - 66,701.42
66,701.43 - 121,575.00
121,575.01 - 204,154.30
204,154.31 - 655,266.30
655,266.31 - 300,000,000.00
Malad Sp
Rangen Sp
N F Hatch
N F Hatch
Thousand
Thousand
Sand Sp
Box Can
Briggs Sp
Niagara S
Crystal S
Blue Lake
Devil's C
Devil's W

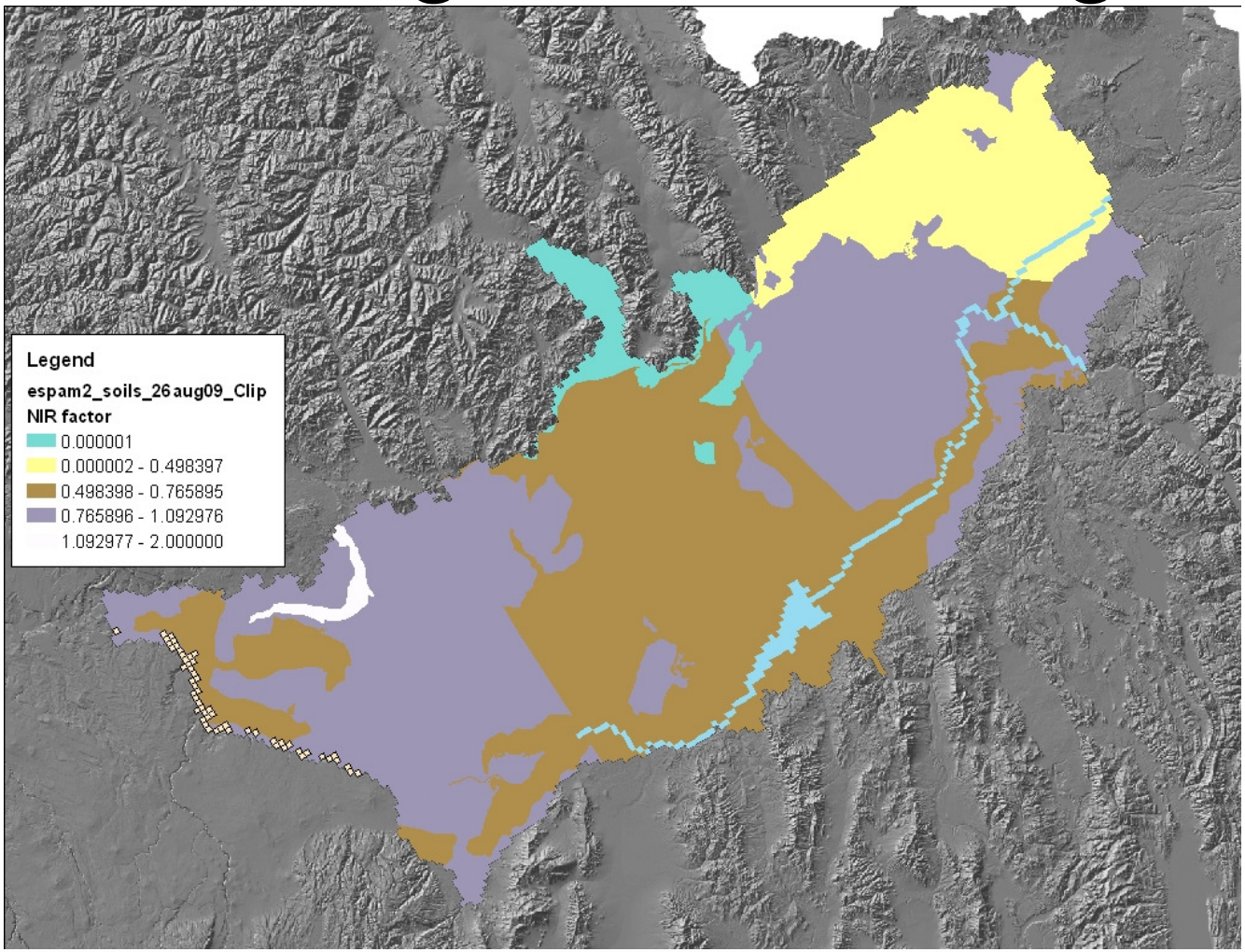
Perched River Seepage



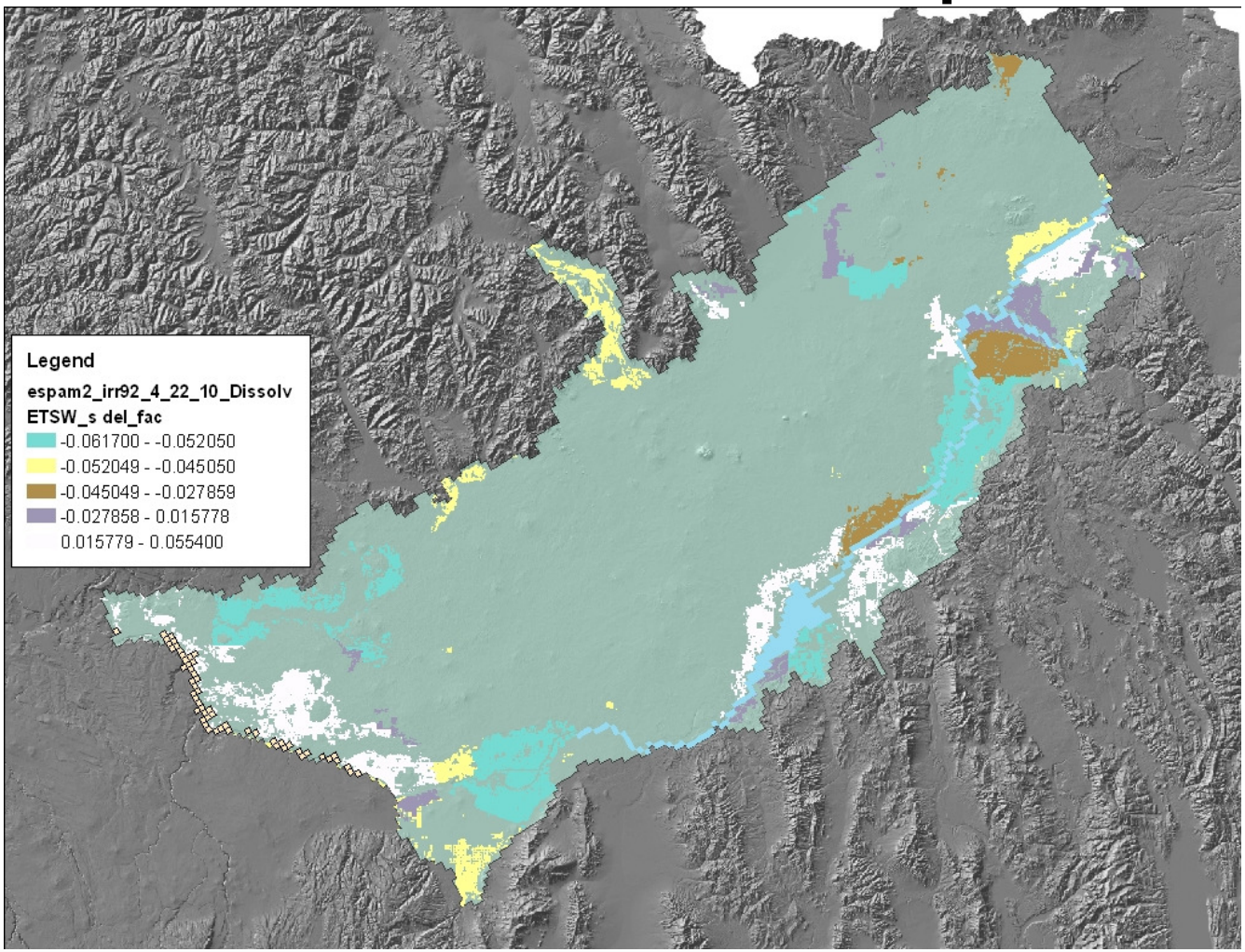
Tributary Underflow



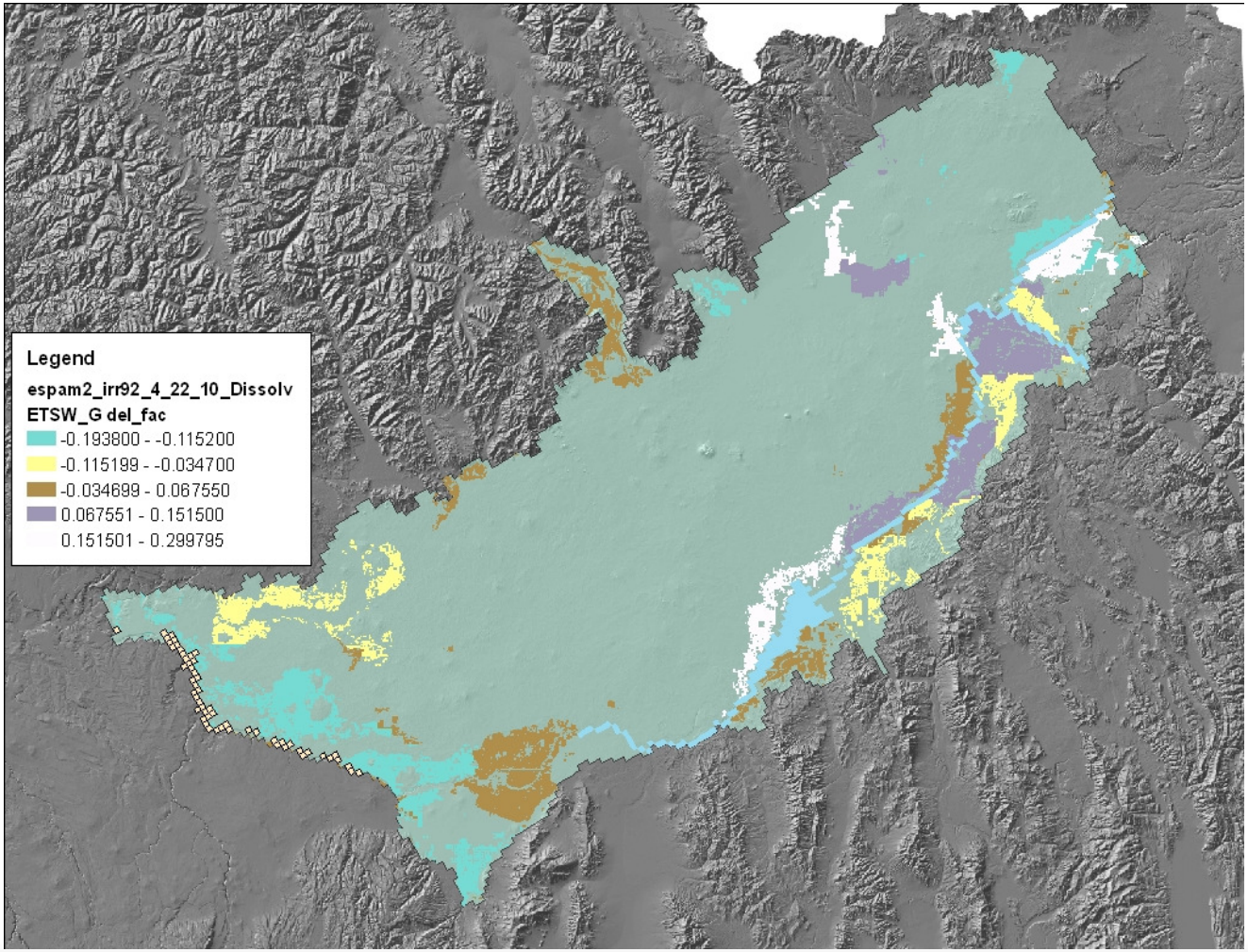
Non-irrigated Recharge



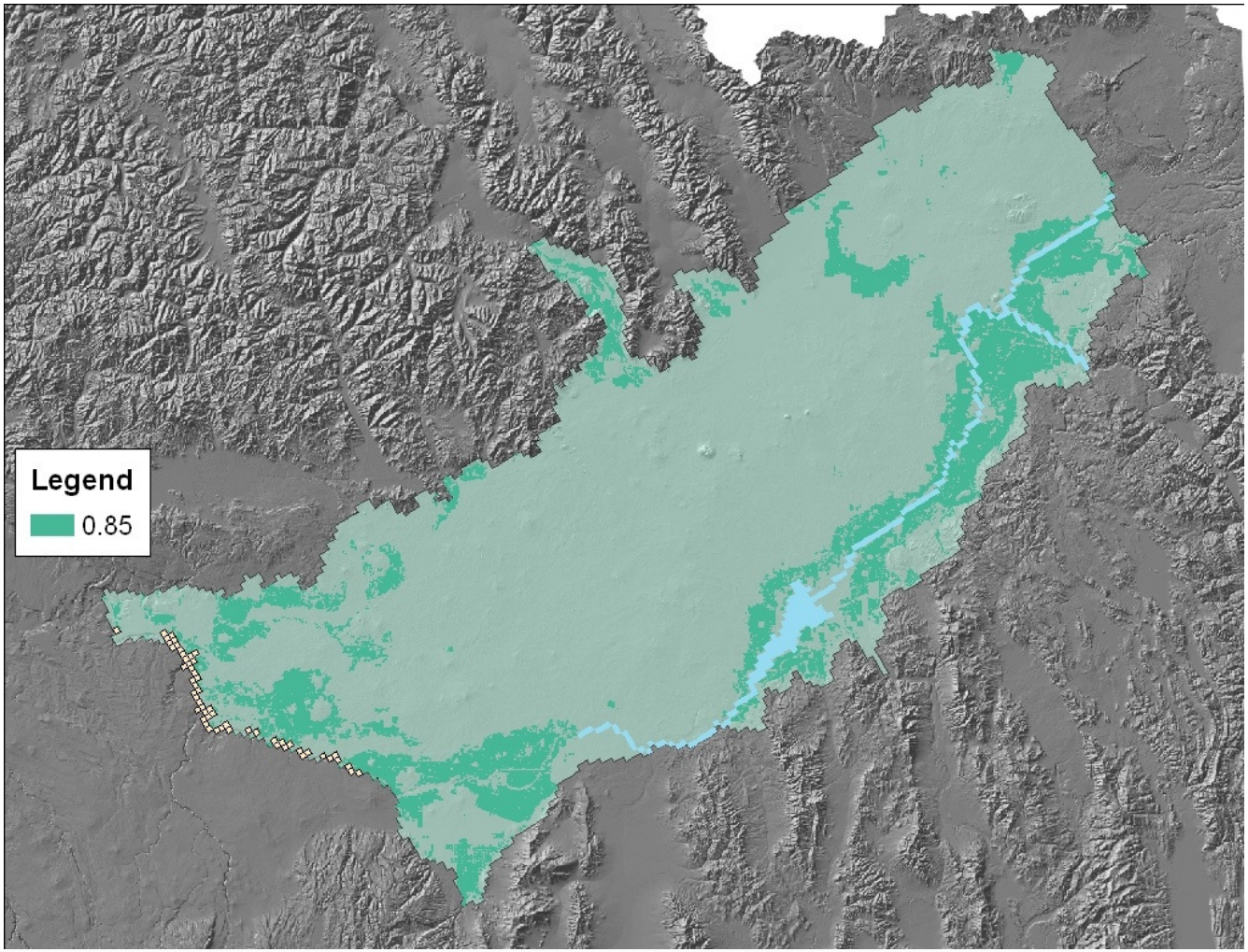
ET Surface Water Sprinkler



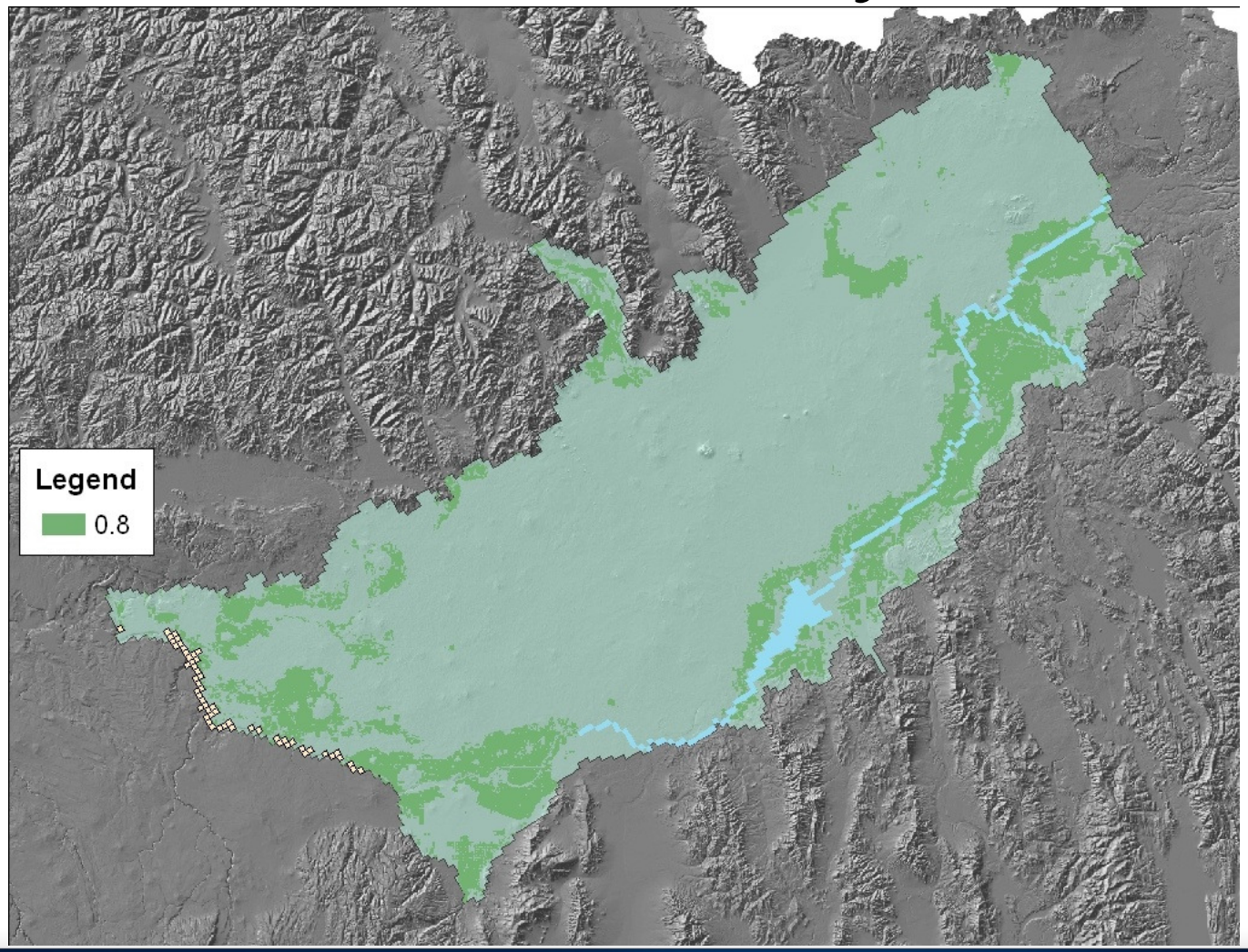
ET Surface Water Gravity



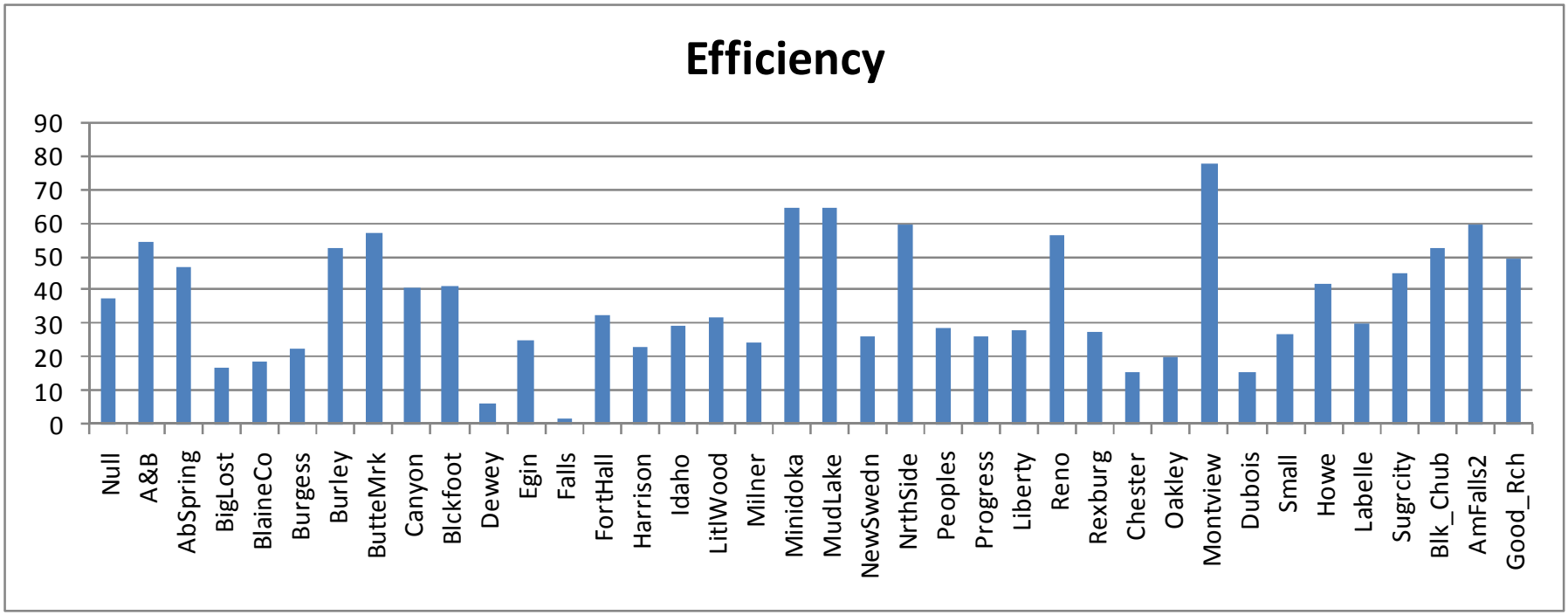
Surface Water Sprinkler Efficiency

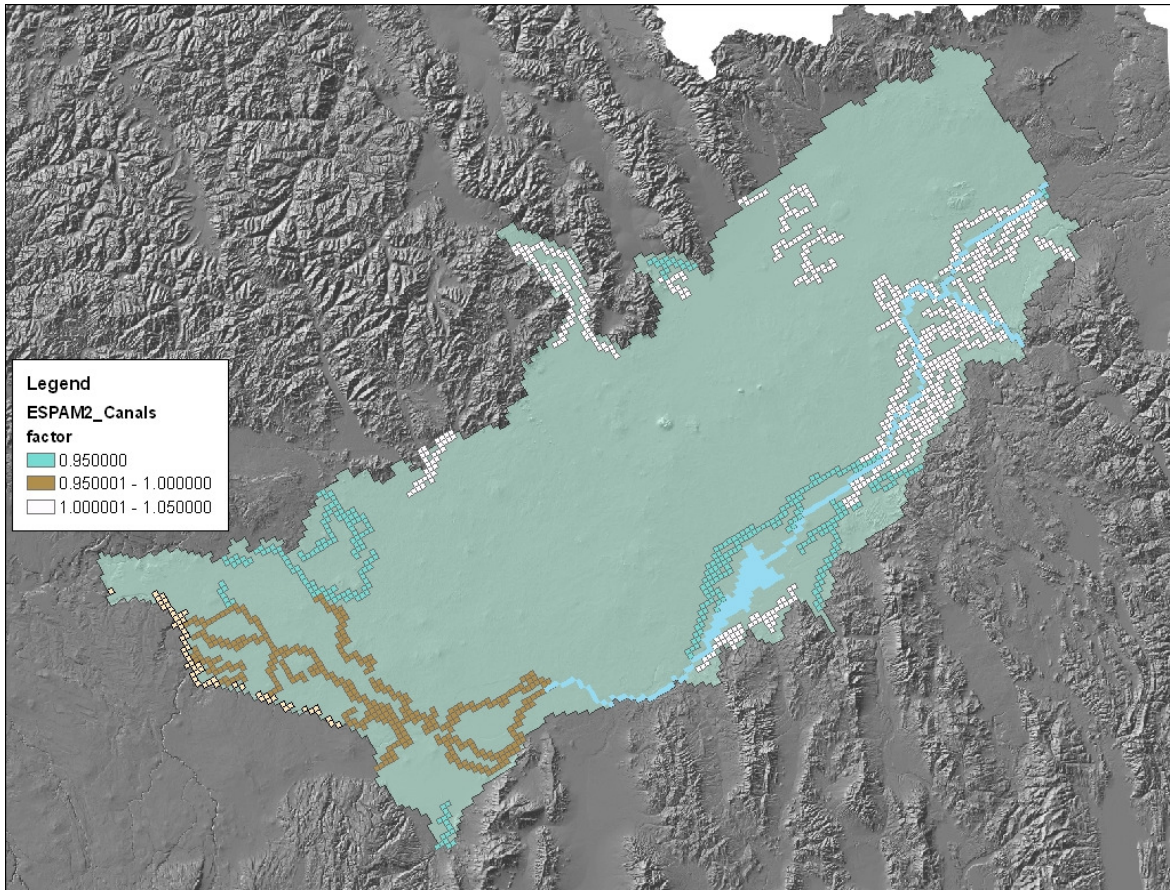


Surface Water Gravity Efficiency

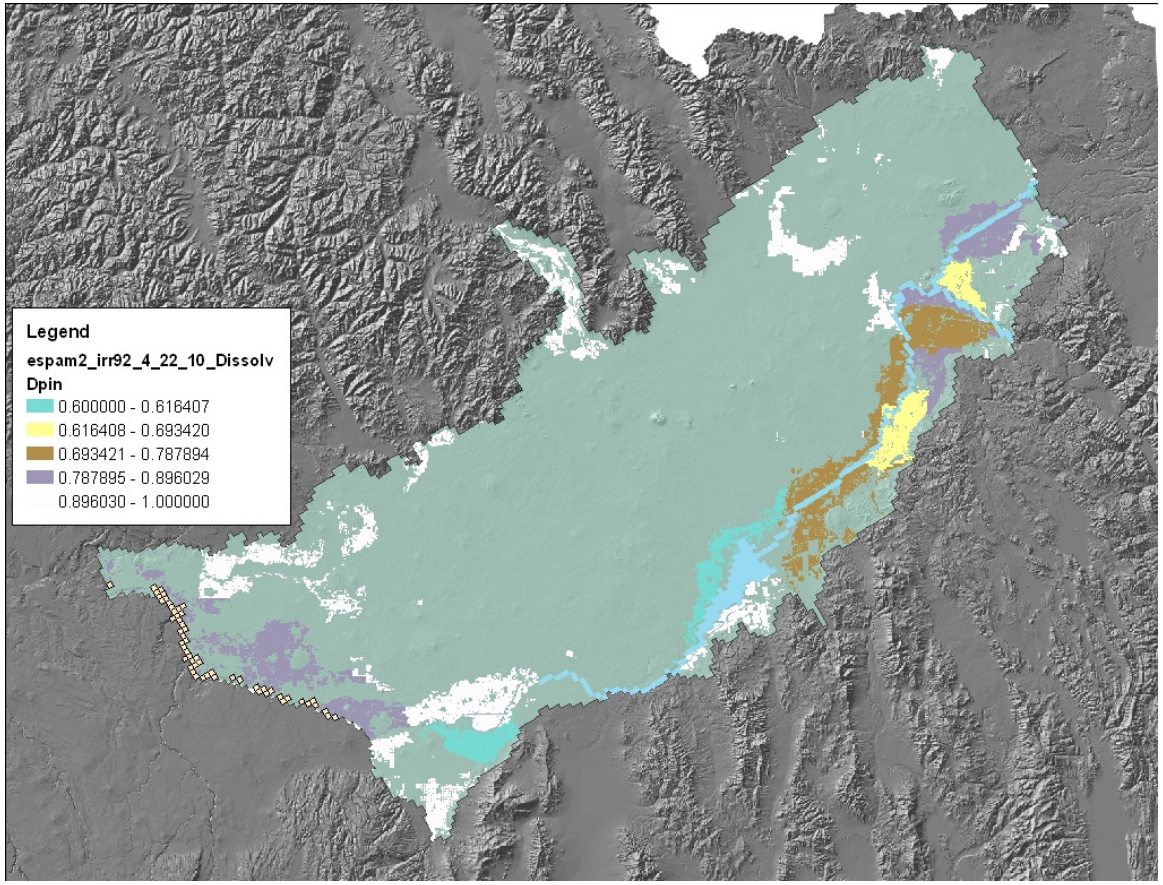


Efficiency = (CIR-deficit)/Applied Water

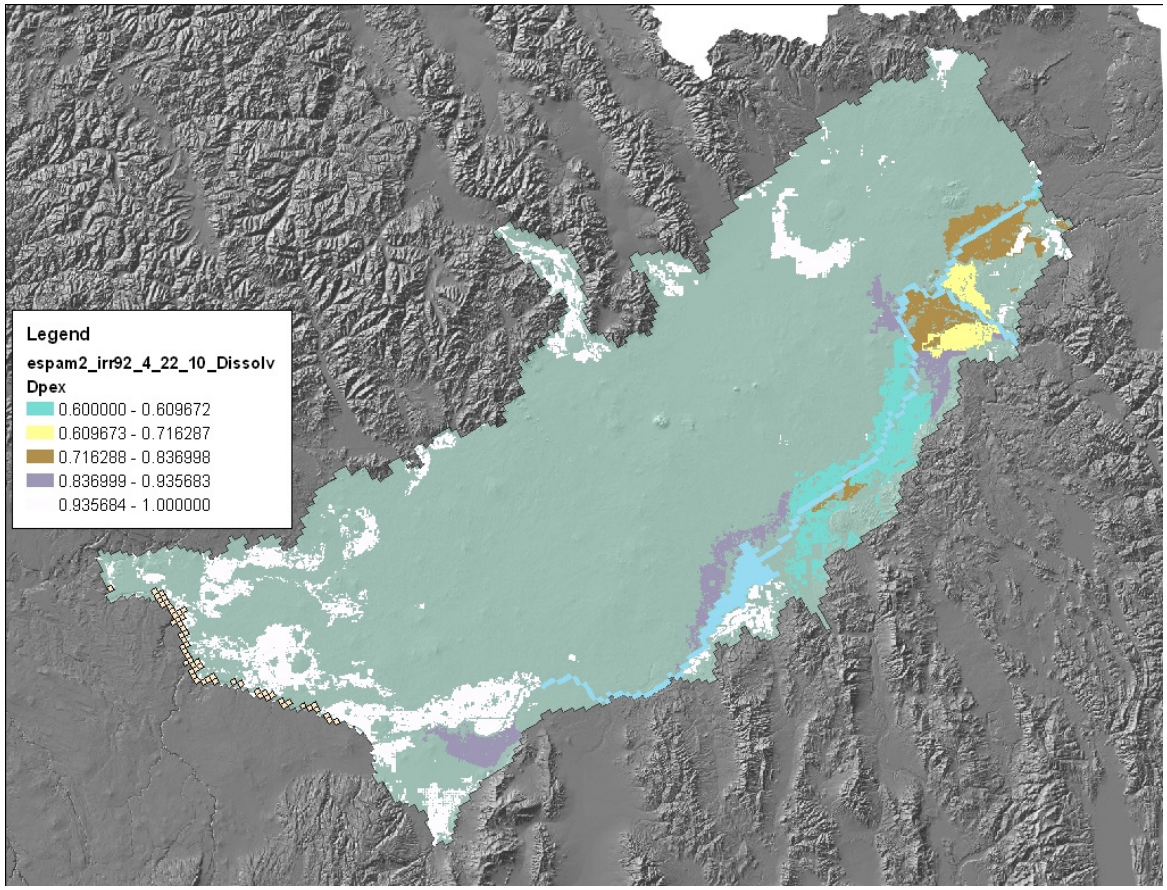




- Canal Seepage
  - CNL fraction * .DIV diversions
  - PEST only allowed to adjust non-coalition entities +/- 5%

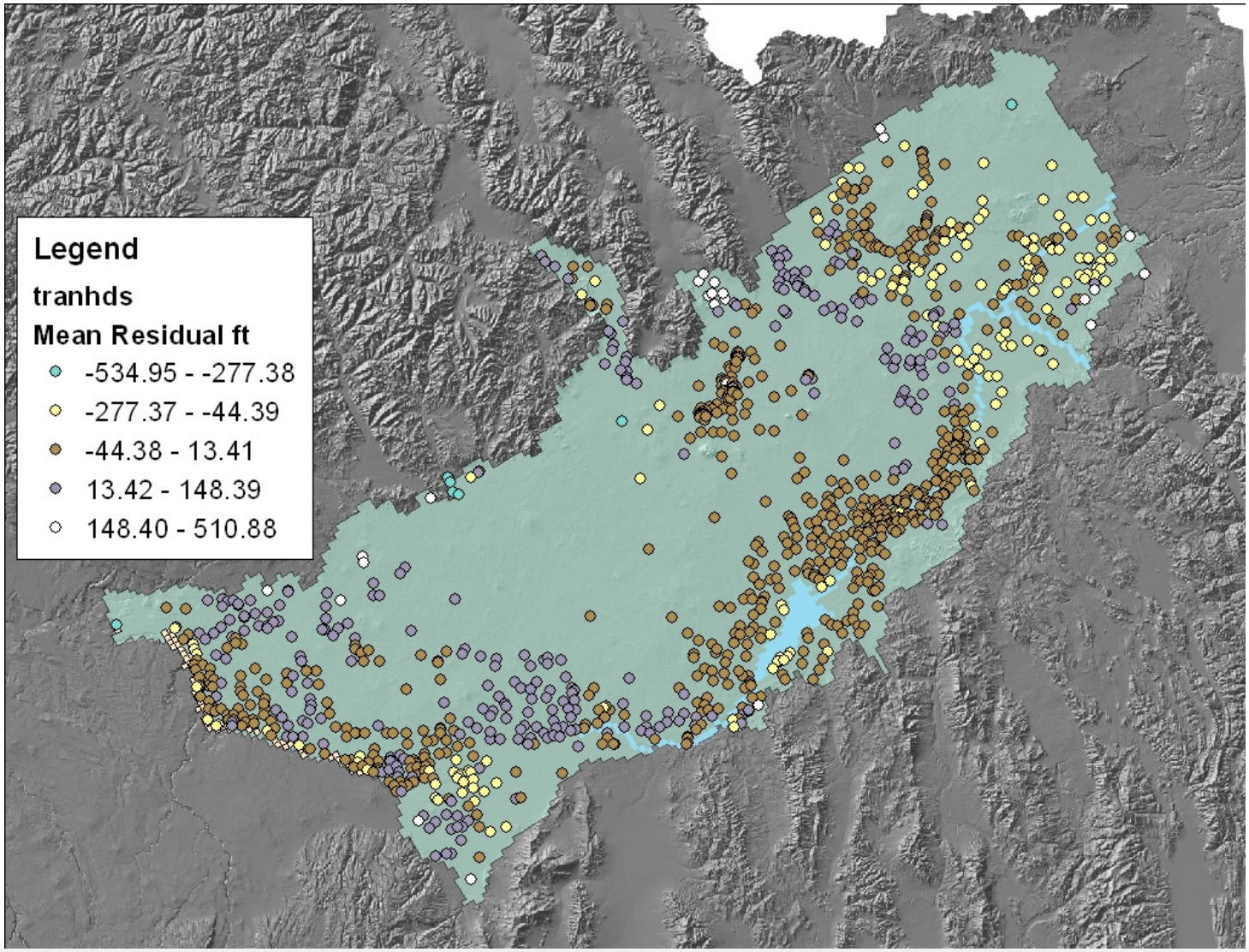


- DPin
  - fraction of the initial irrigation loss (1-eff) that percolates below the root zone
  - Fixed at 1.0 for non-Snake entities and some others
  - PEST allowed to adjust between 0.6-0.98



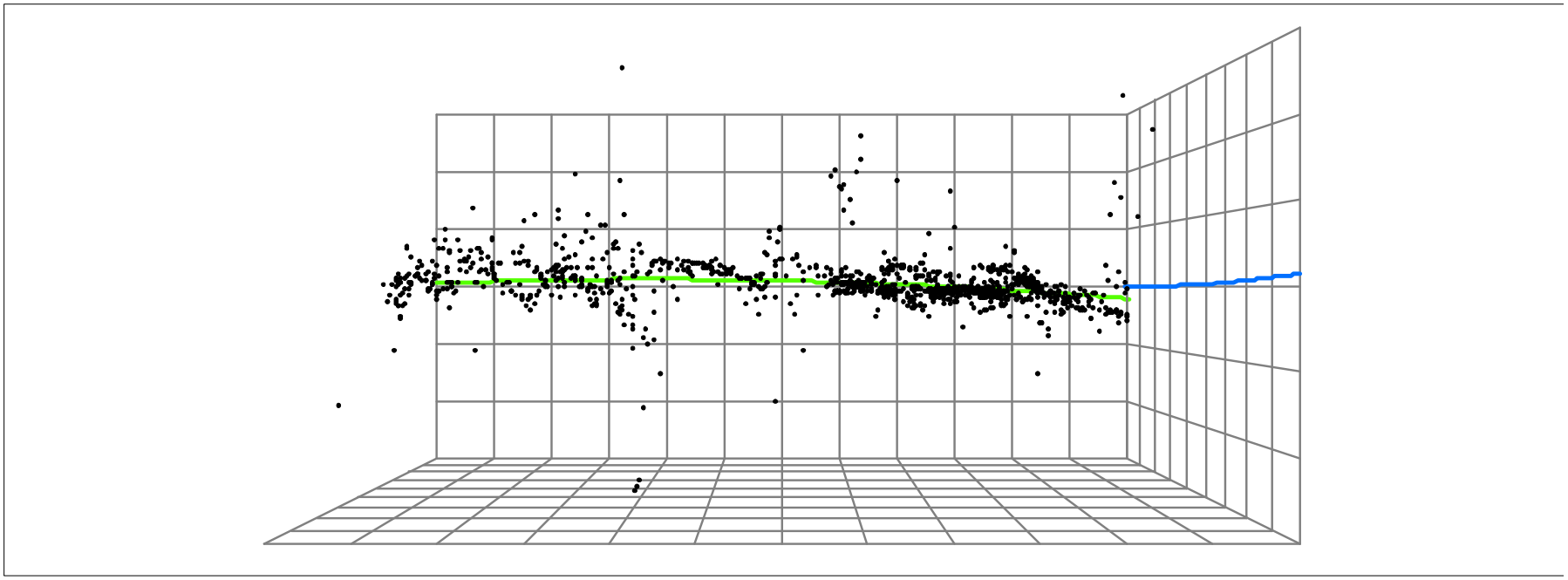
- DPex
  - fraction of delivery exceeding CIR that percolates below the root zone
  - Fixed at 1.0 for non-Snake entities and some others
  - PEST allowed to adjust between 0.6-0.98

Transient Heads

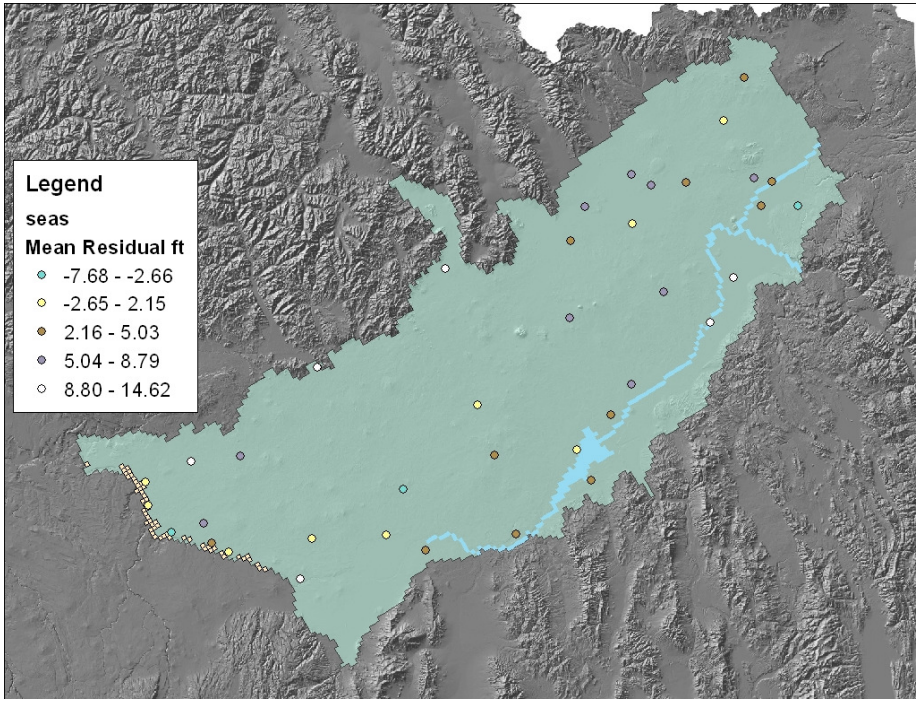


Transient Heads

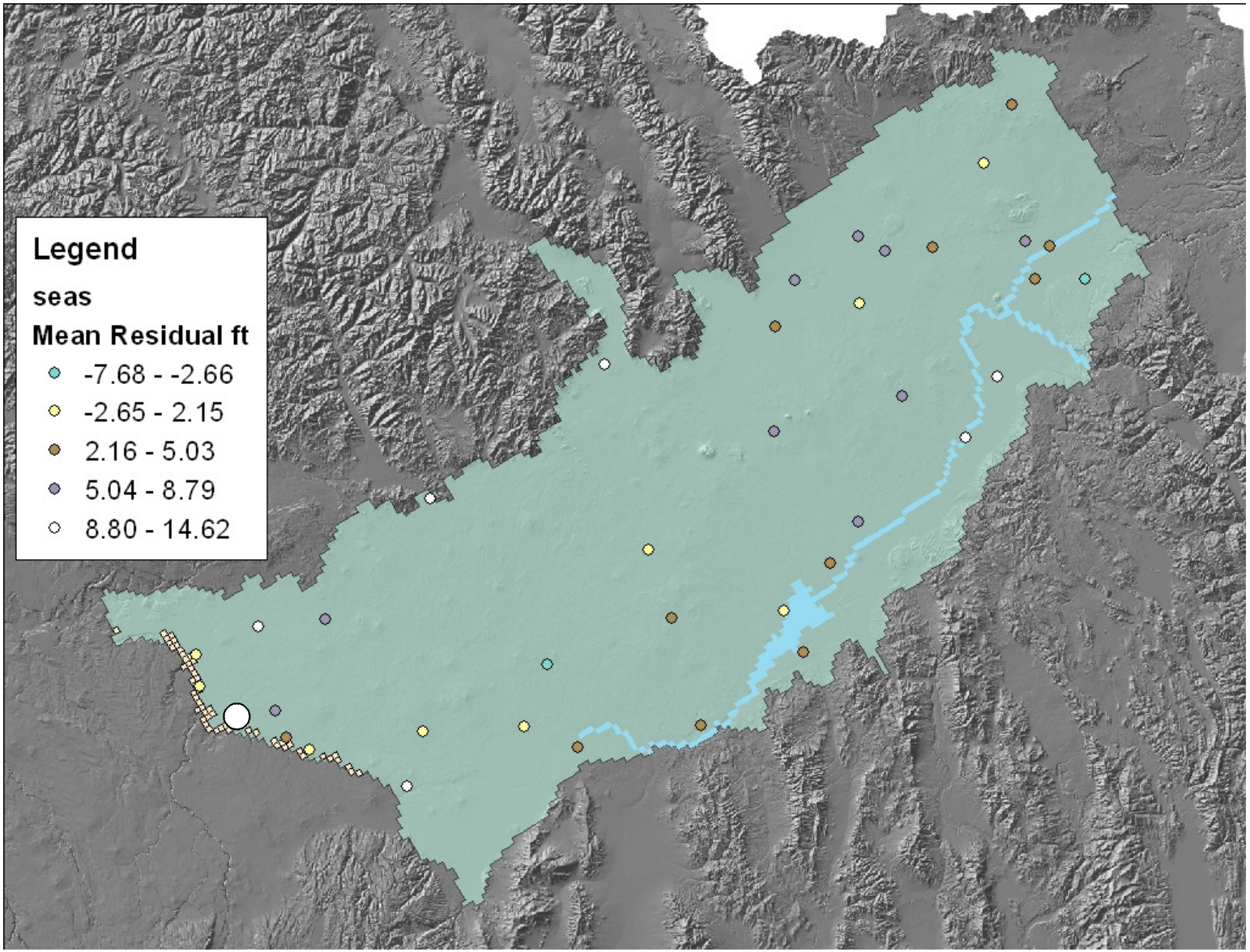
Trend Analysis

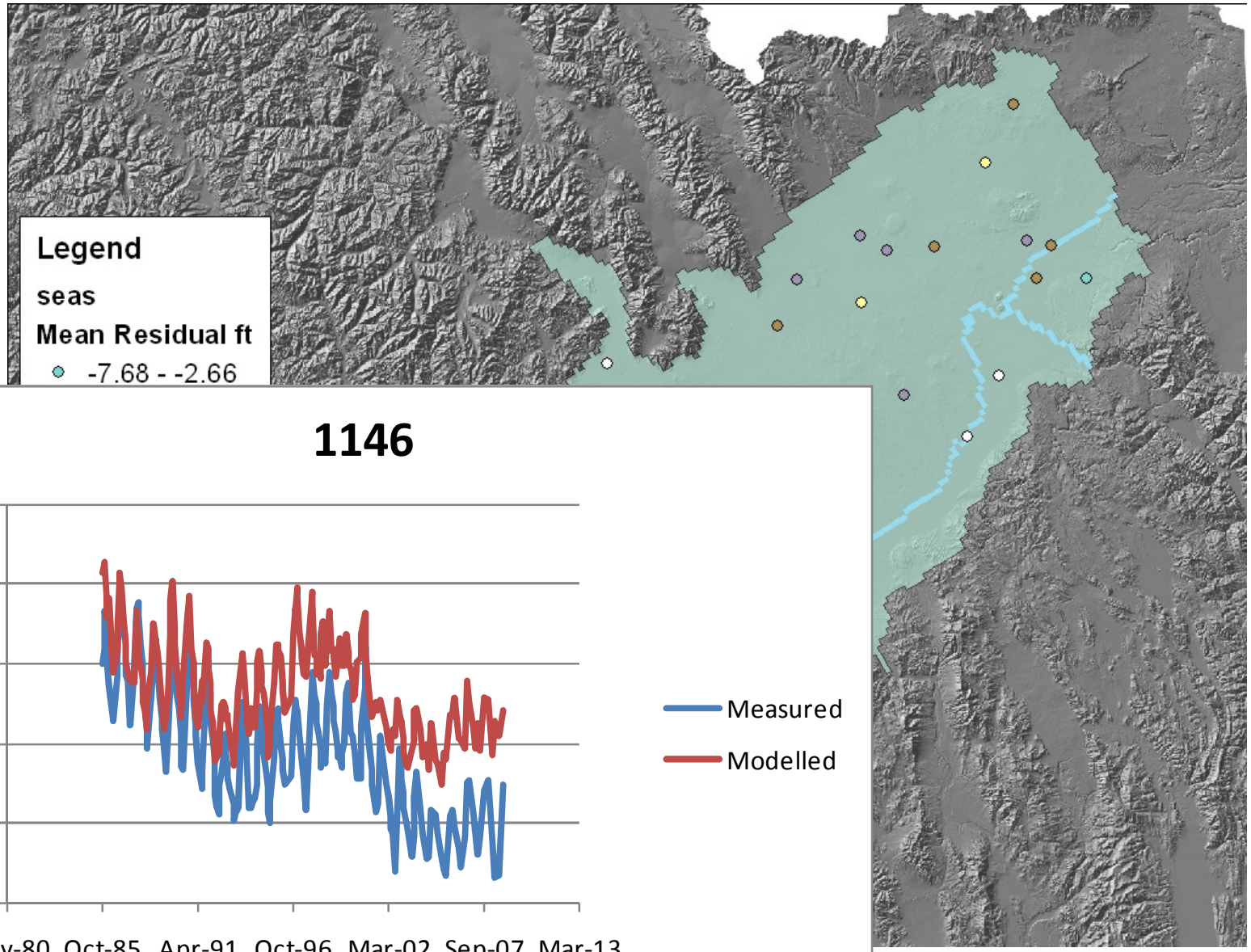


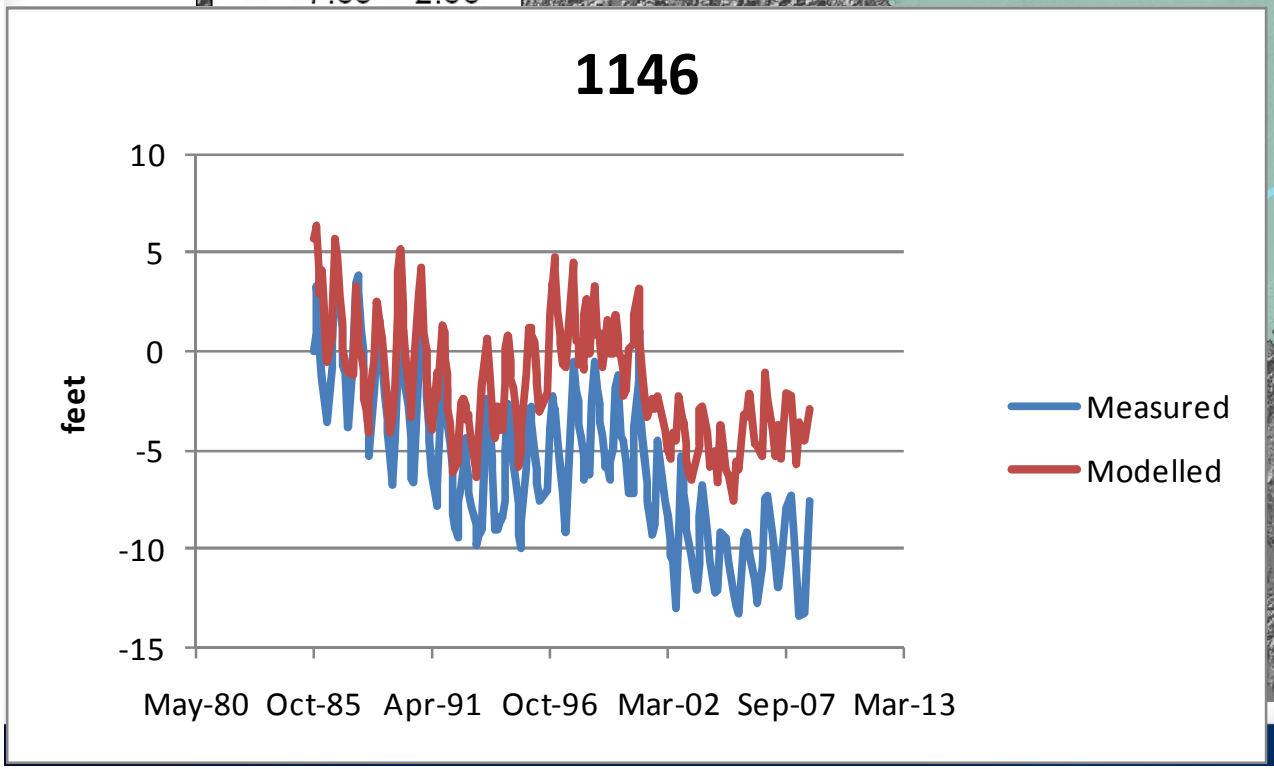
Data Source: tranhds Attribute: Mean

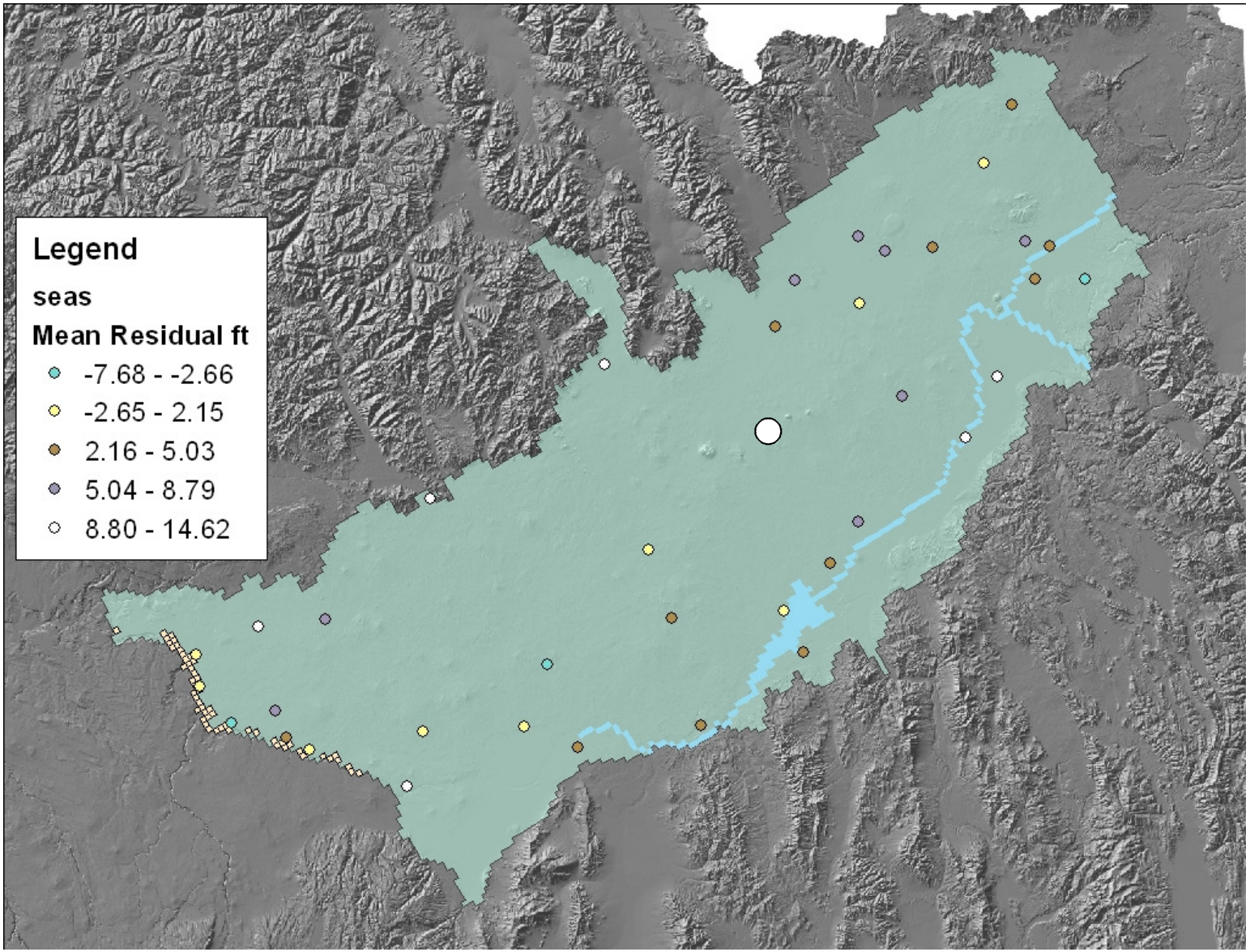


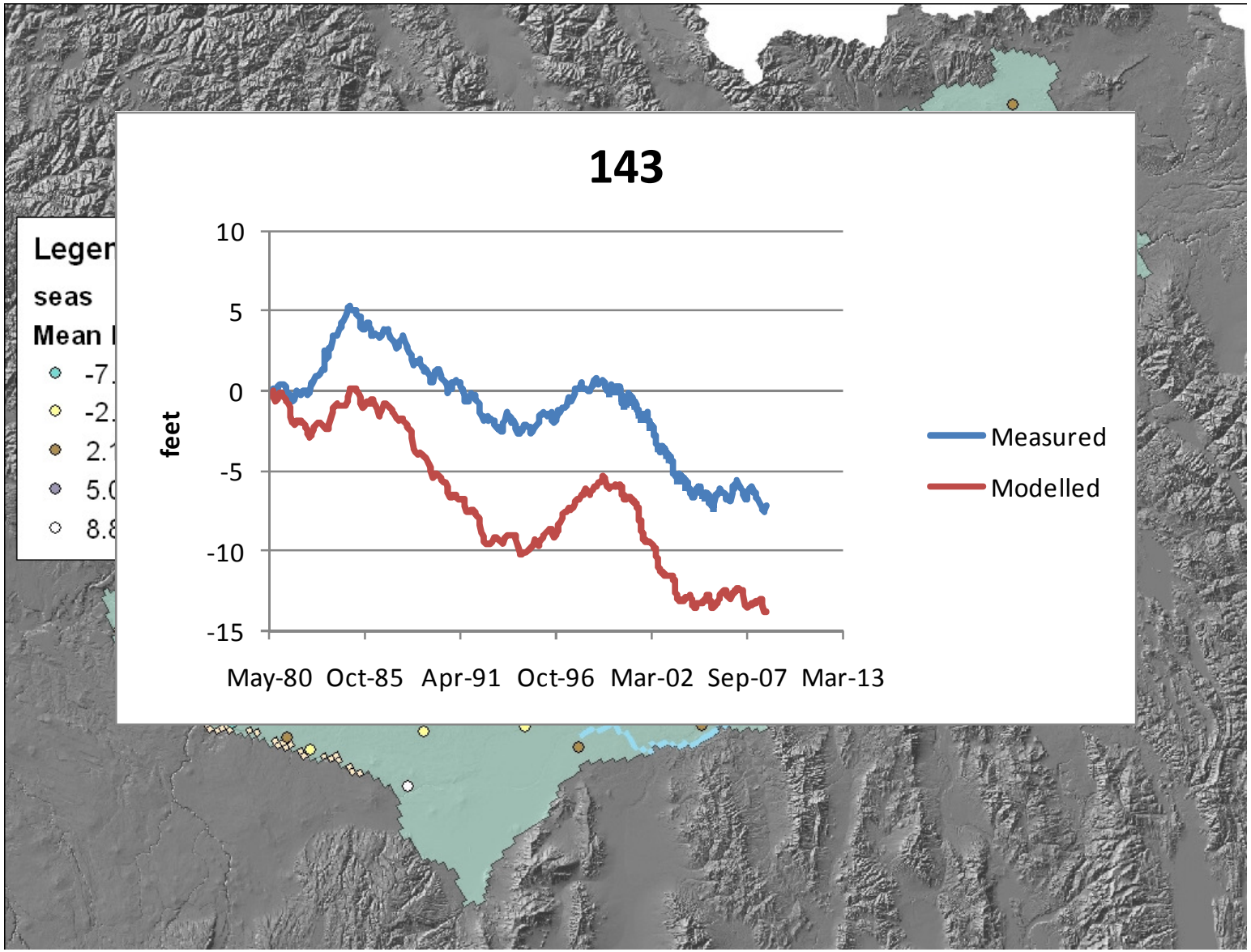
- Hundreds to thousands of observations
  - Lots of data
  - Limited spatial coverage

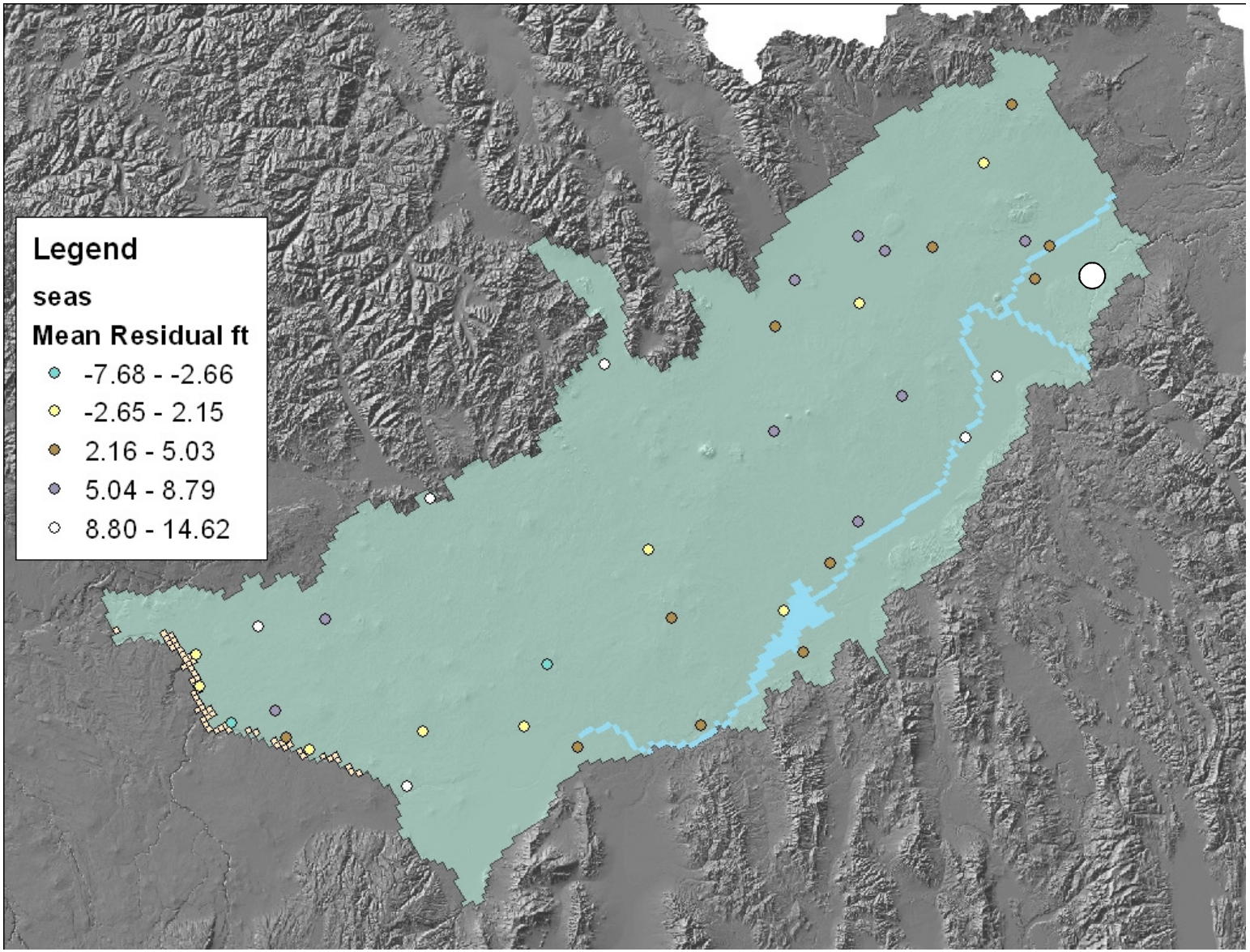

Legend
seas
Mean Residual ft
-7.68 - -2.66
-2.65 - 2.15
2.16 - 5.03
5.04 - 8.79
8.80 - 14.62

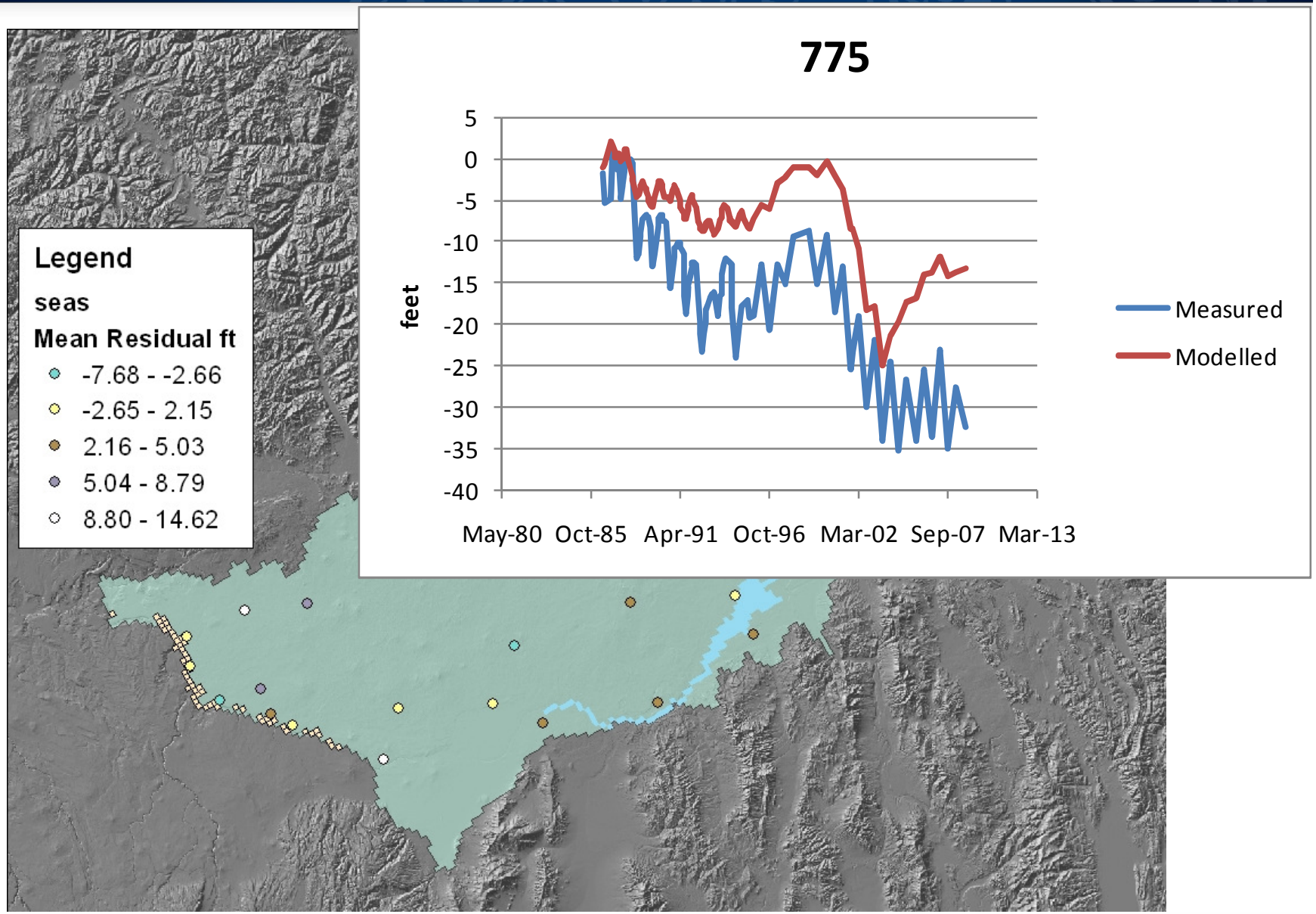

Legend
seas
Mean Residual ft
-7.68 - -2.66

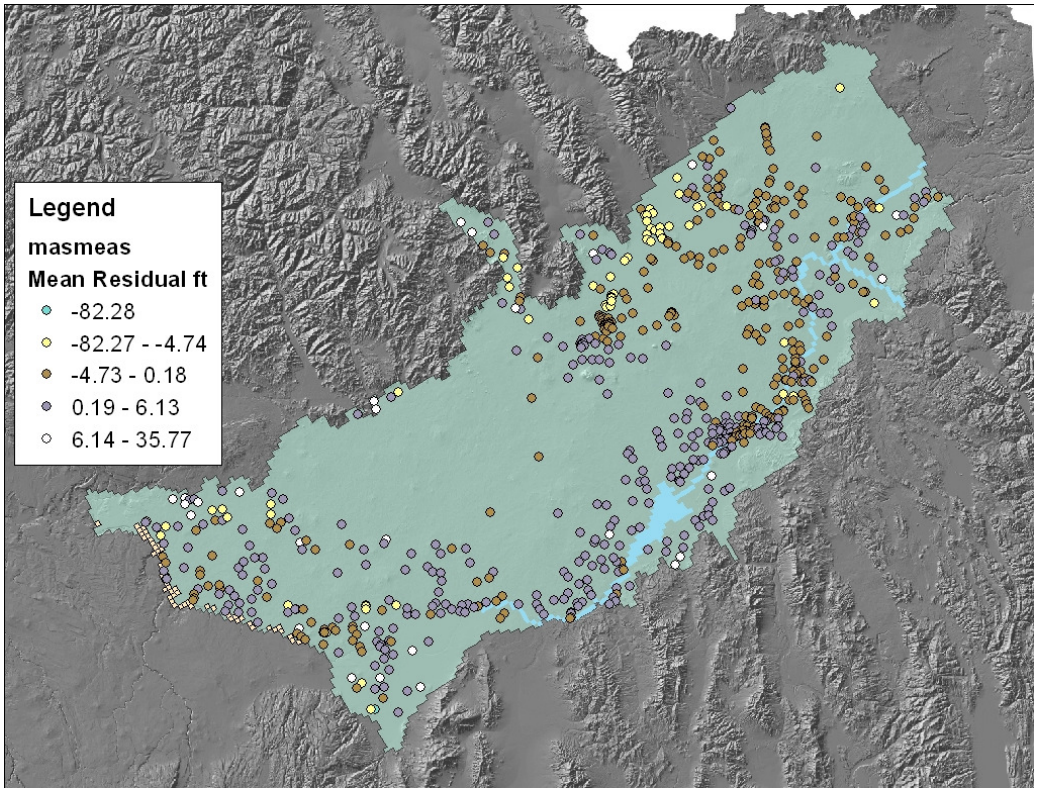

1146
10
5
0
-5
-10
-15
feet
May-80
Oct-85
Apr-91
Oct-96
Mar-02
Sep-07
Mar-13
Measured
Modelled


Legend
seas
Mean Residual ft
-7.68 - -2.66
-2.65 - 2.15
2.16 - 5.03
5.04 - 8.79
8.80 - 14.62

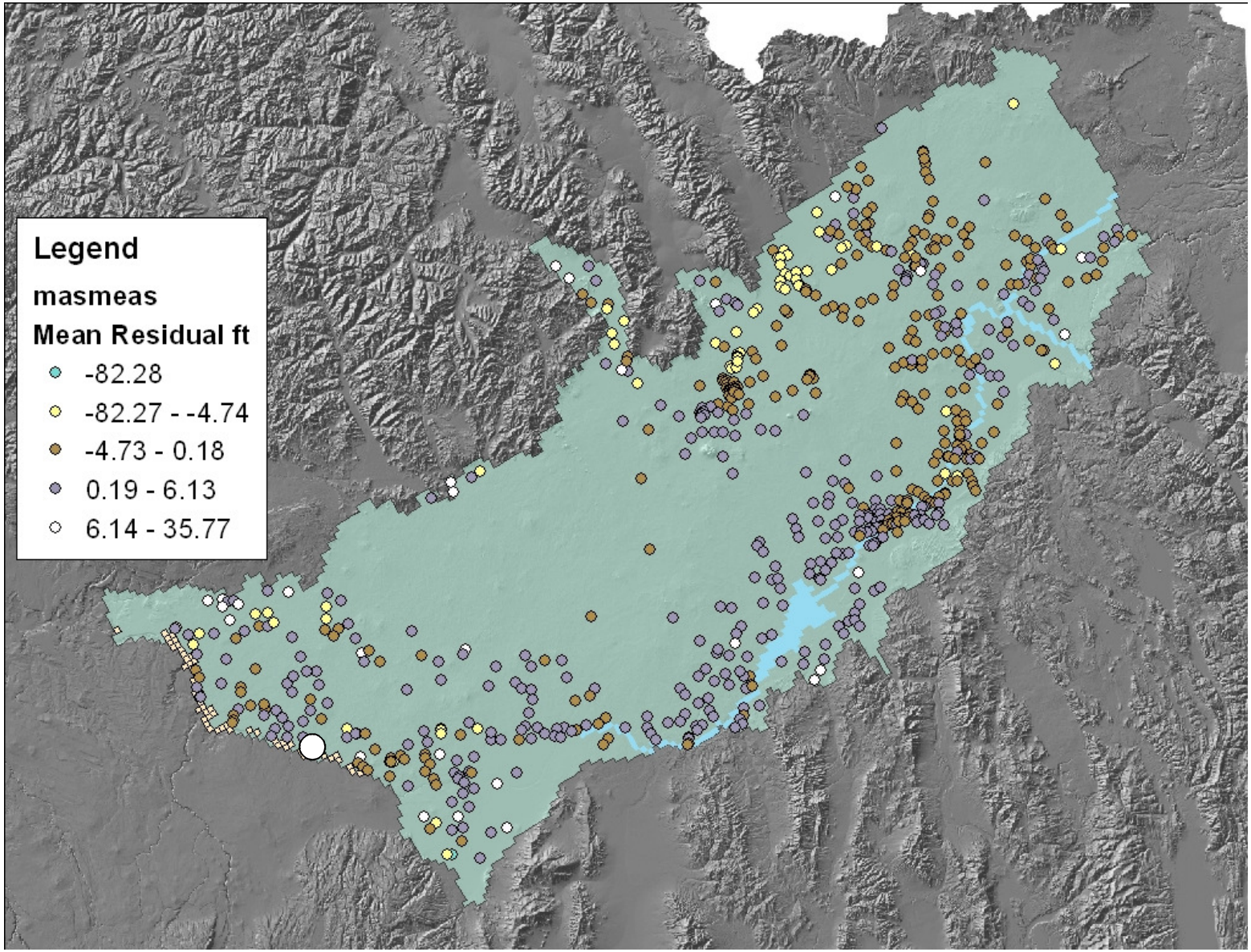

143
10
5
0
-5
-10
-15
feet
May-80
Oct-85
Apr-91
Oct-96
Mar-02
Sep-07
Mar-13
Measured
Modelled
Leger
seas
Mean


Legend
seas
Mean Residual ft
-7.68 - -2.66
-2.65 - 2.15
2.16 - 5.03
5.04 - 8.79
8.80 - 14.62

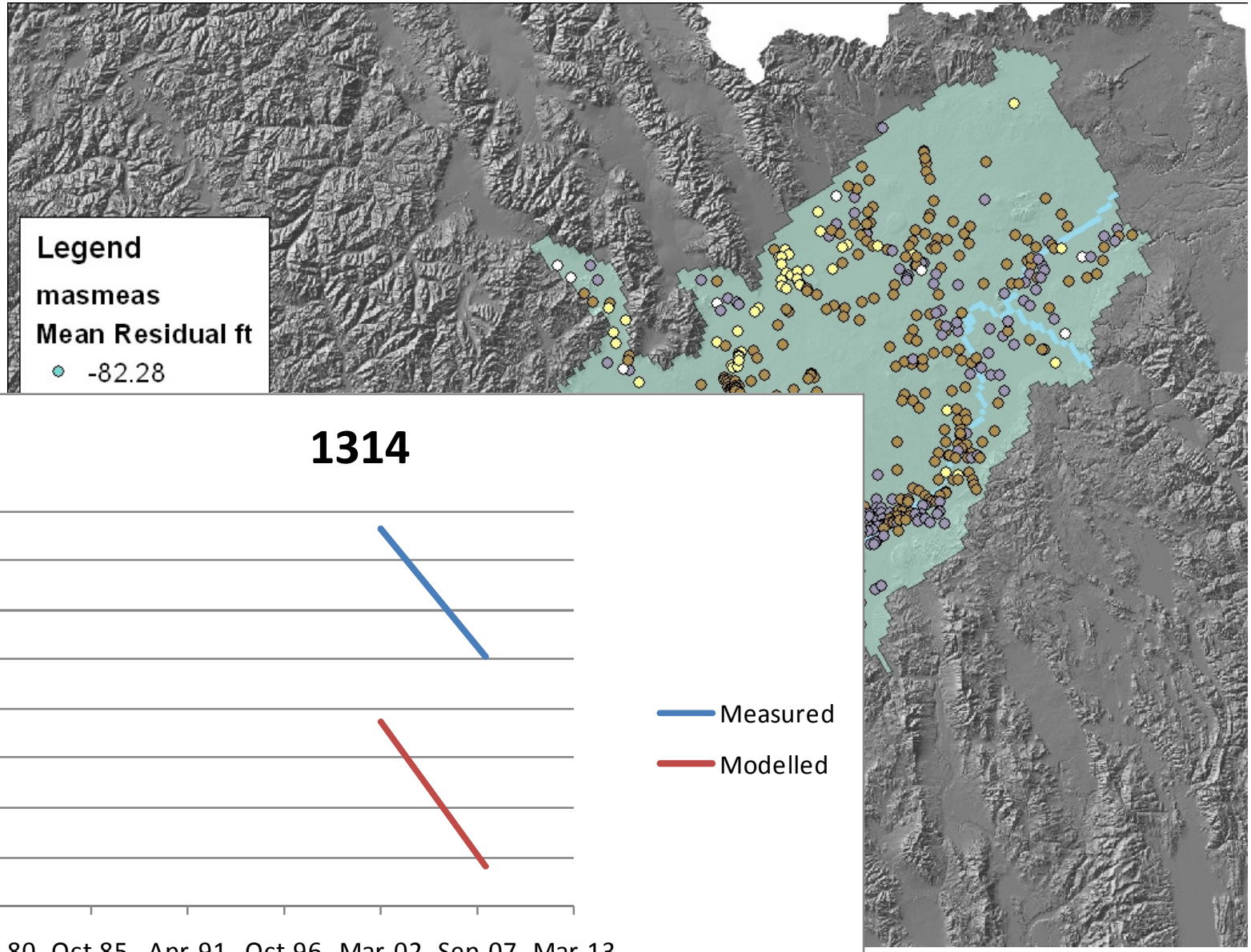

Legend
seas
Mean Residual ft
-7.68 - -2.66
-2.65 - 2.15
2.16 - 5.03
5.04 - 8.79
8.80 - 14.62
775
feet
5
0
-5
-10
-15
-20
-25
-30
-35
-40
May-80
Oct-85
Apr-91
Oct-96
Mar-02
Sep-07
Mar-13
Measured
Modelled

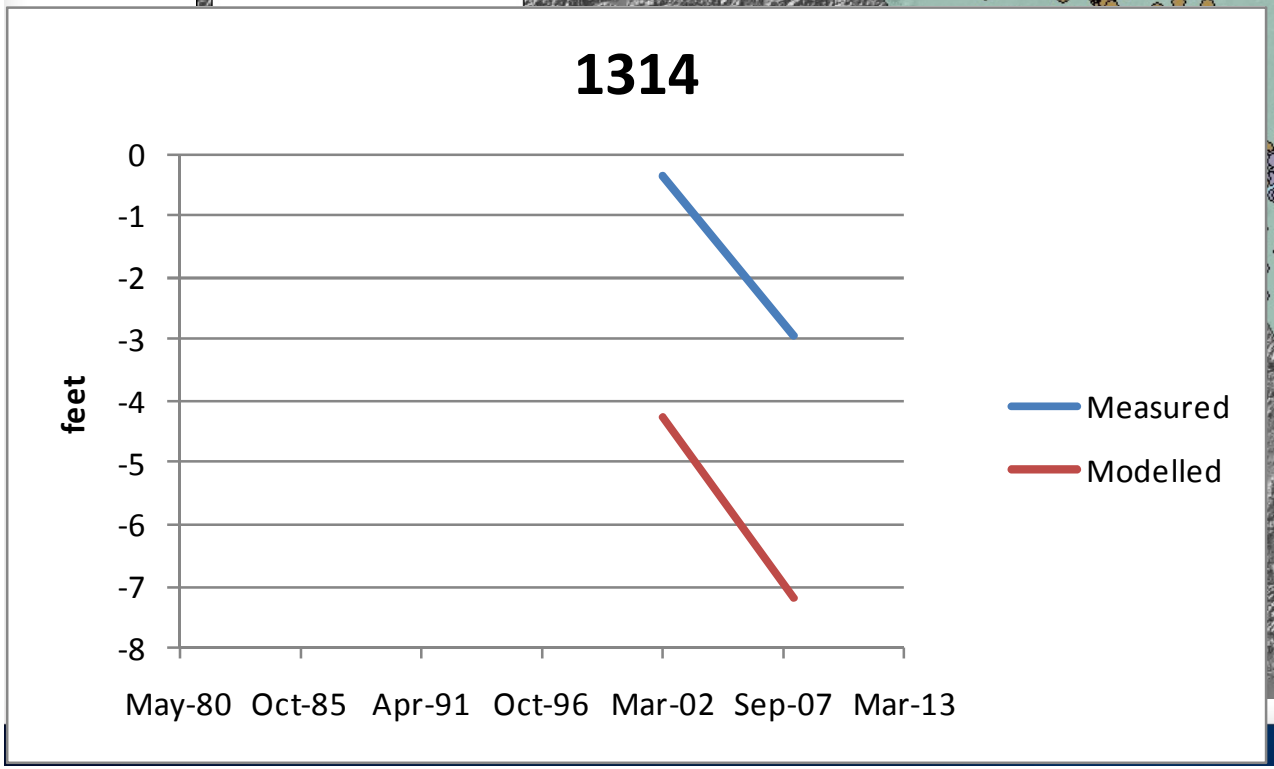


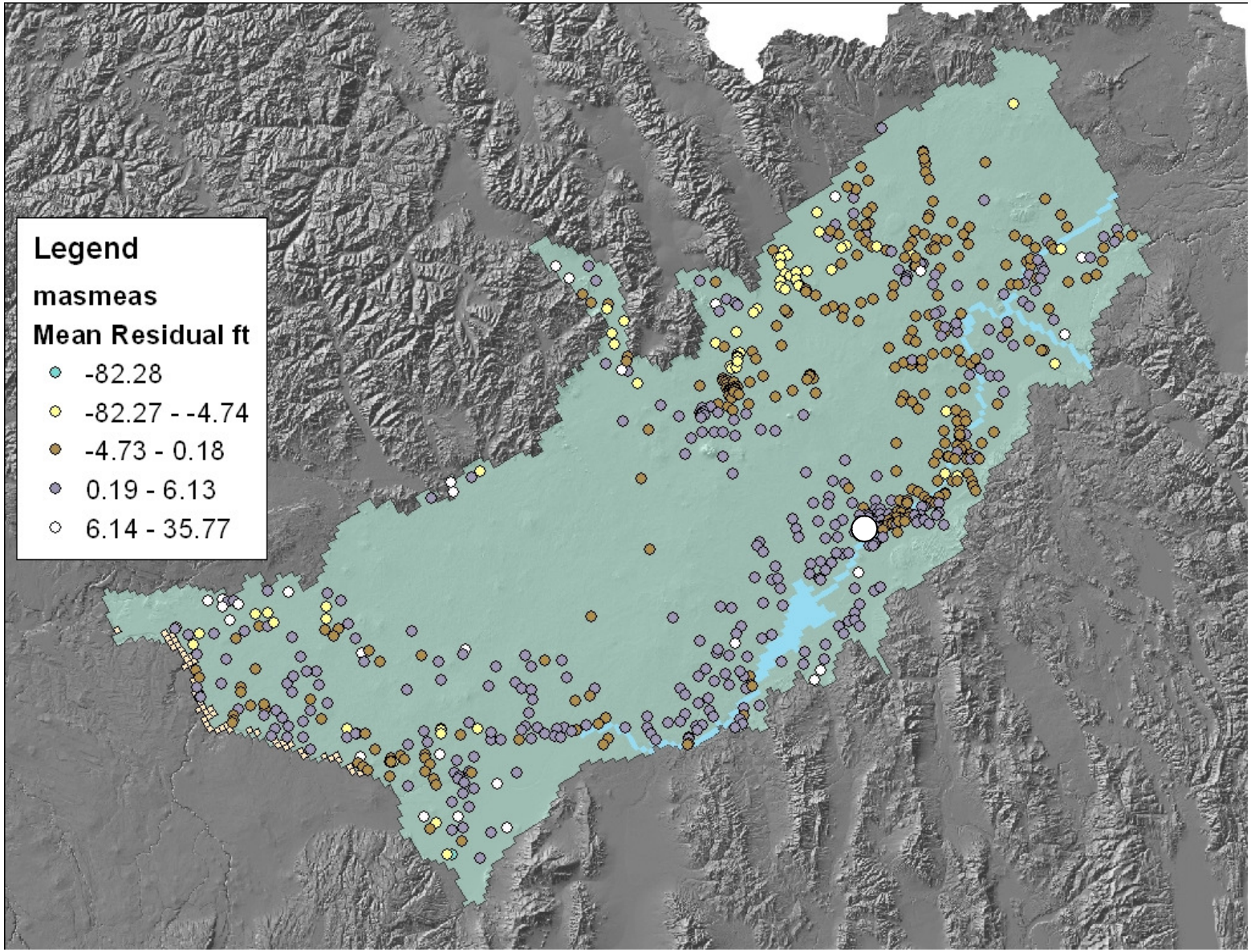
– Mass Measurement

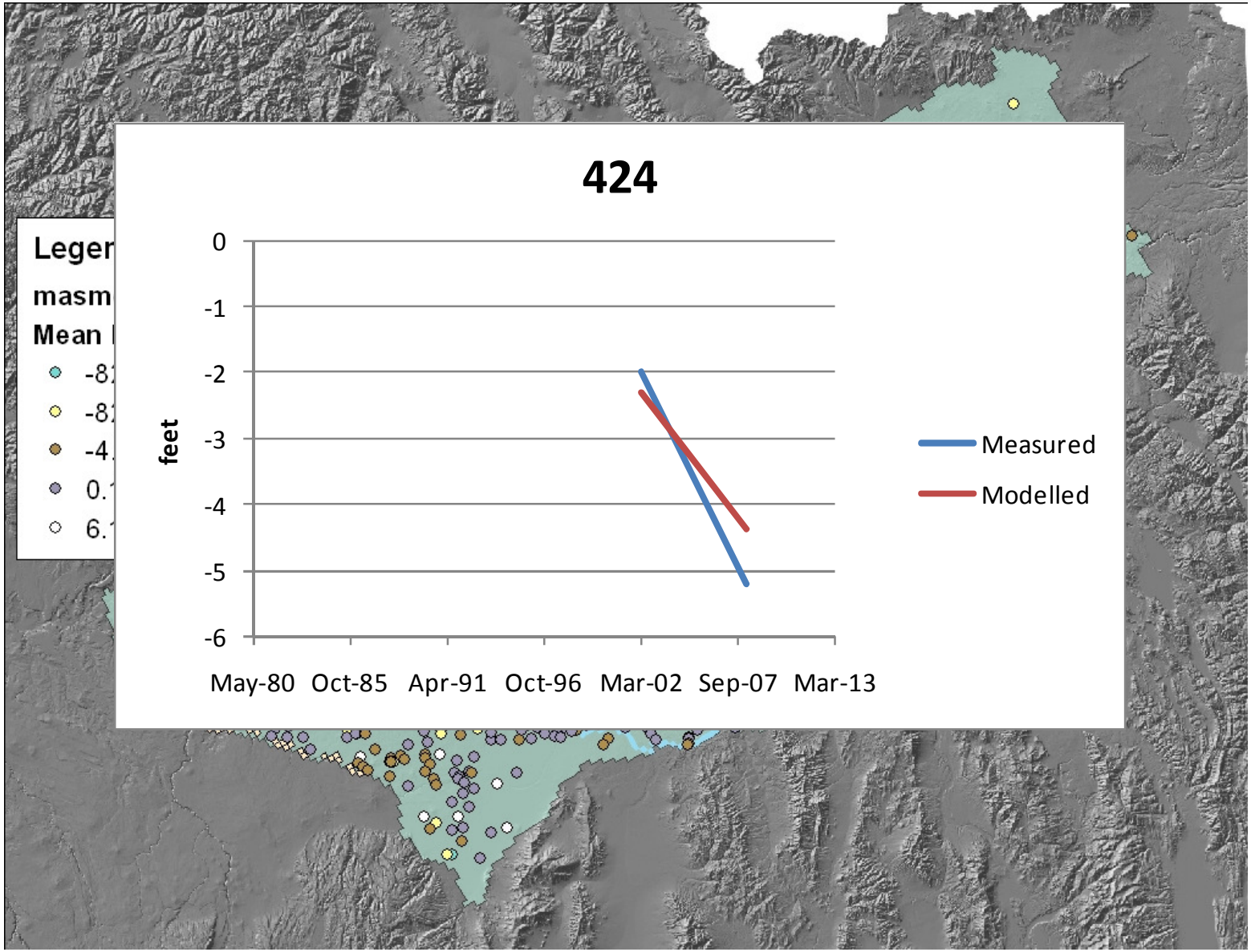

Legend
masmeas
Mean Residual ft
-82.28
-82.27 - -4.74
-4.73 - 0.18
0.19 - 6.13
6.14 - 35.77

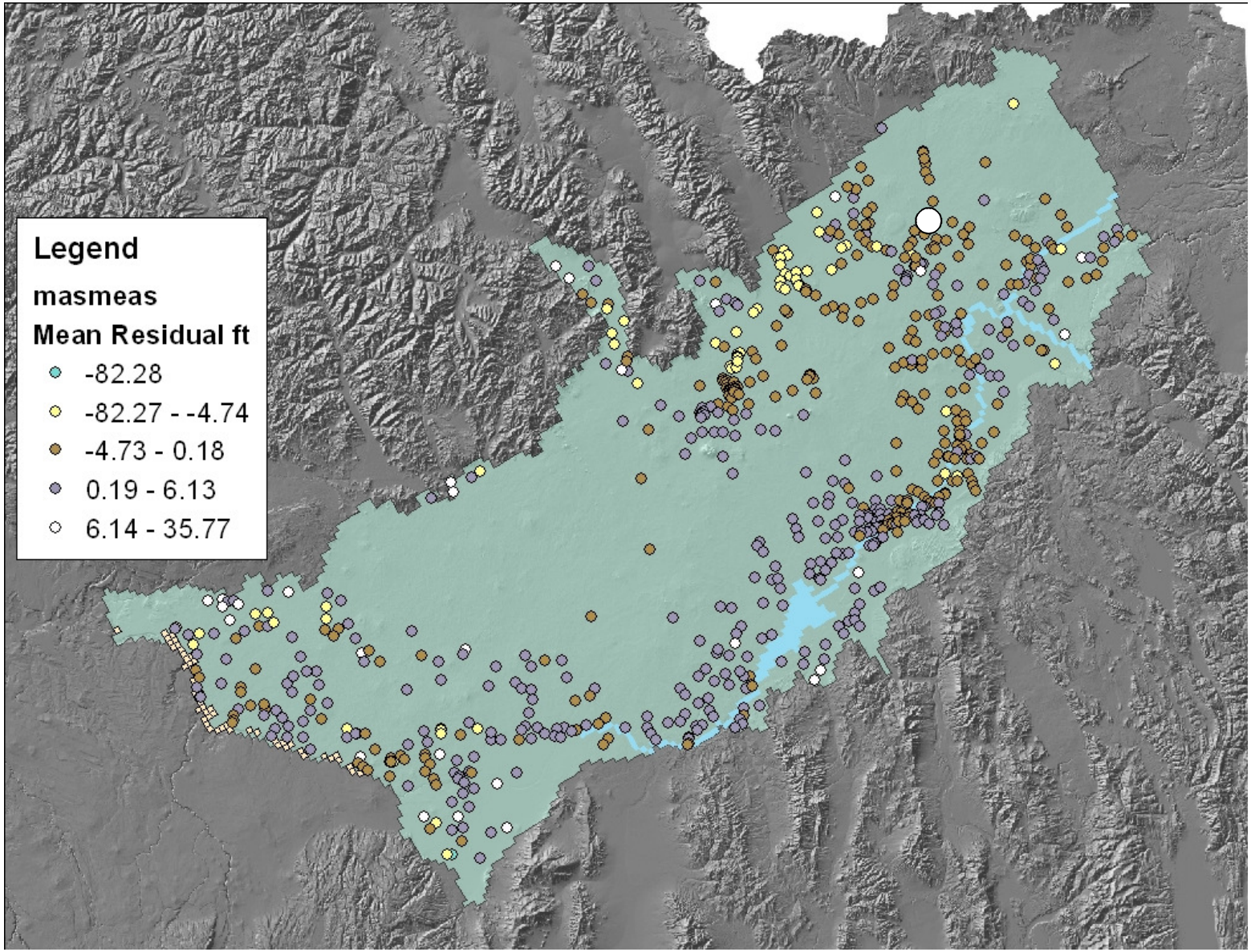
IDAHO Department of Water Resources

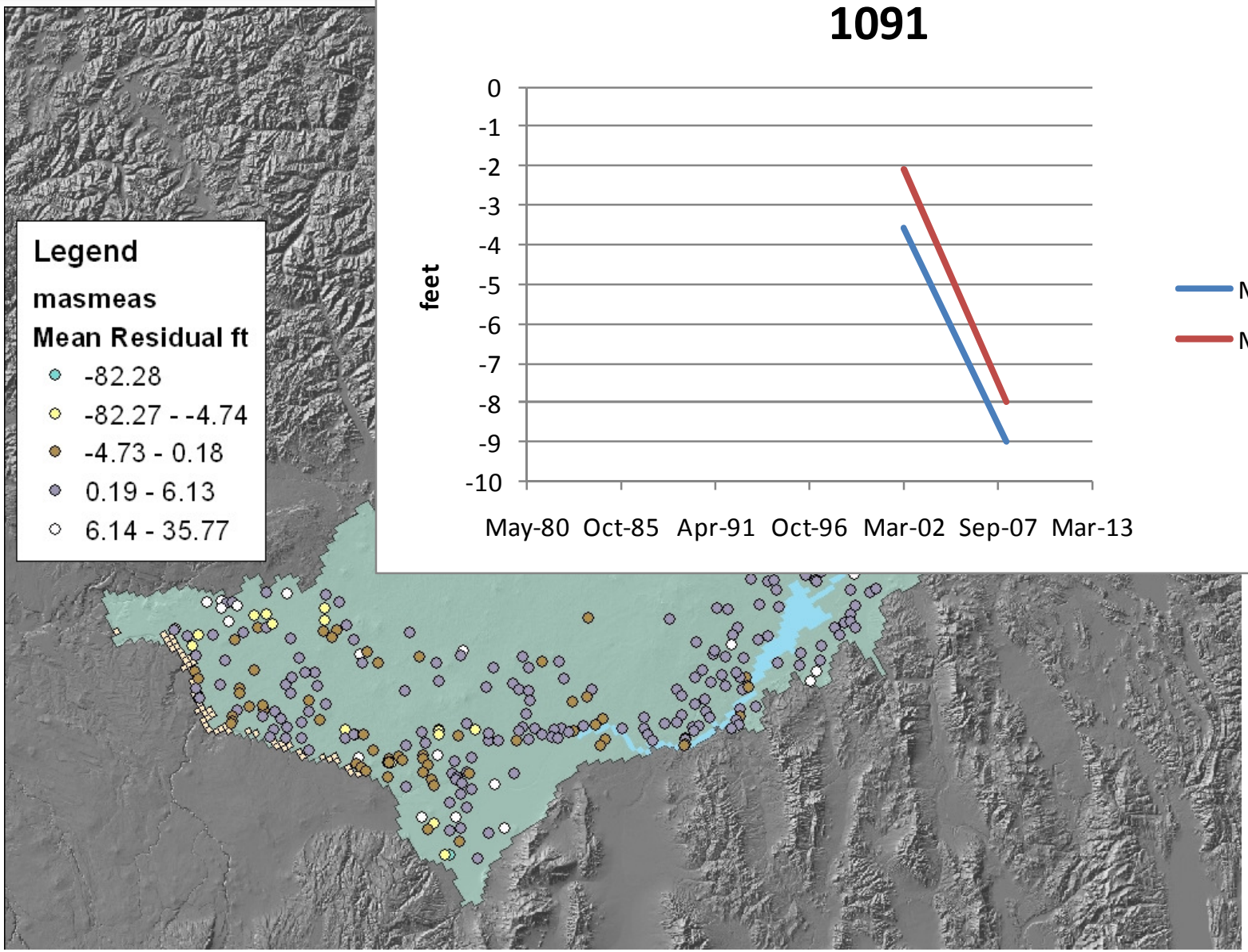


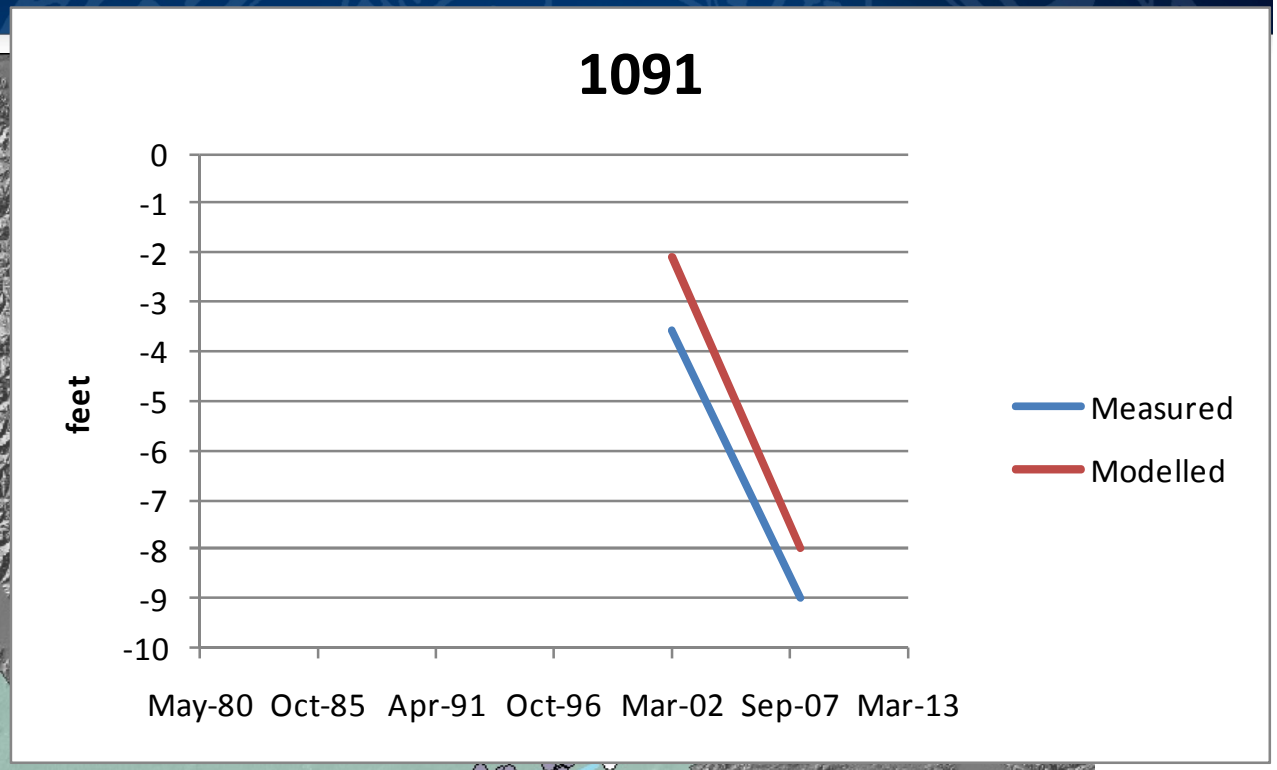


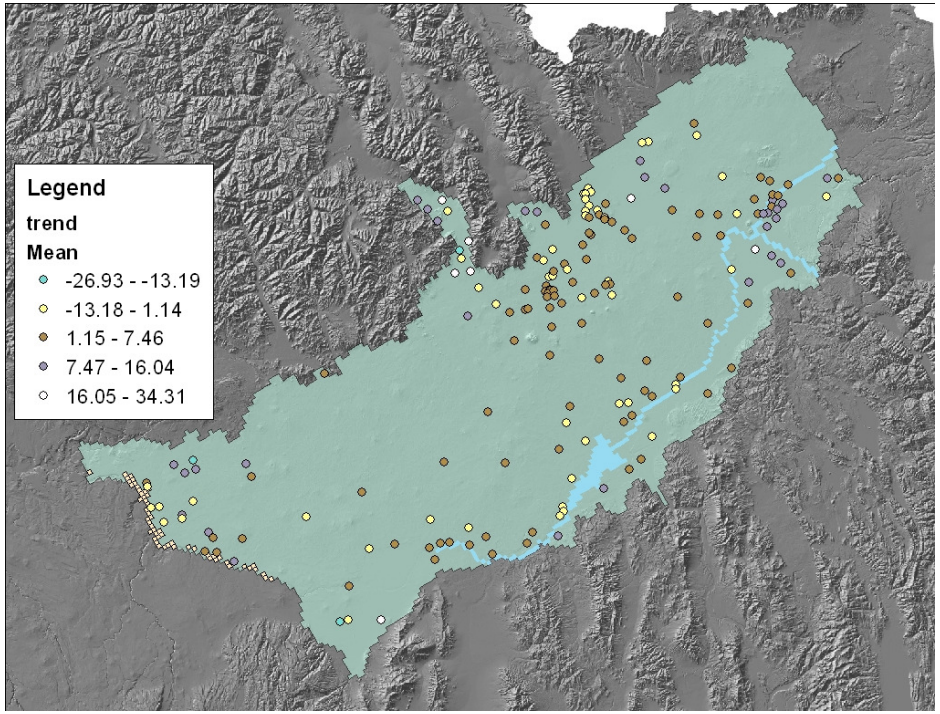

Legend
masmeas
Mean Residual ft
-82.28
-82.27 - -4.74
-4.73 - 0.18
0.19 - 6.13
6.14 - 35.77


424
0
-1
-2
-3
-4
-5
-6
feet
May-80
Oct-85
Apr-91
Oct-96
Mar-02
Sep-07
Mar-13
Measured
Modelled
Leger
masm
Mean

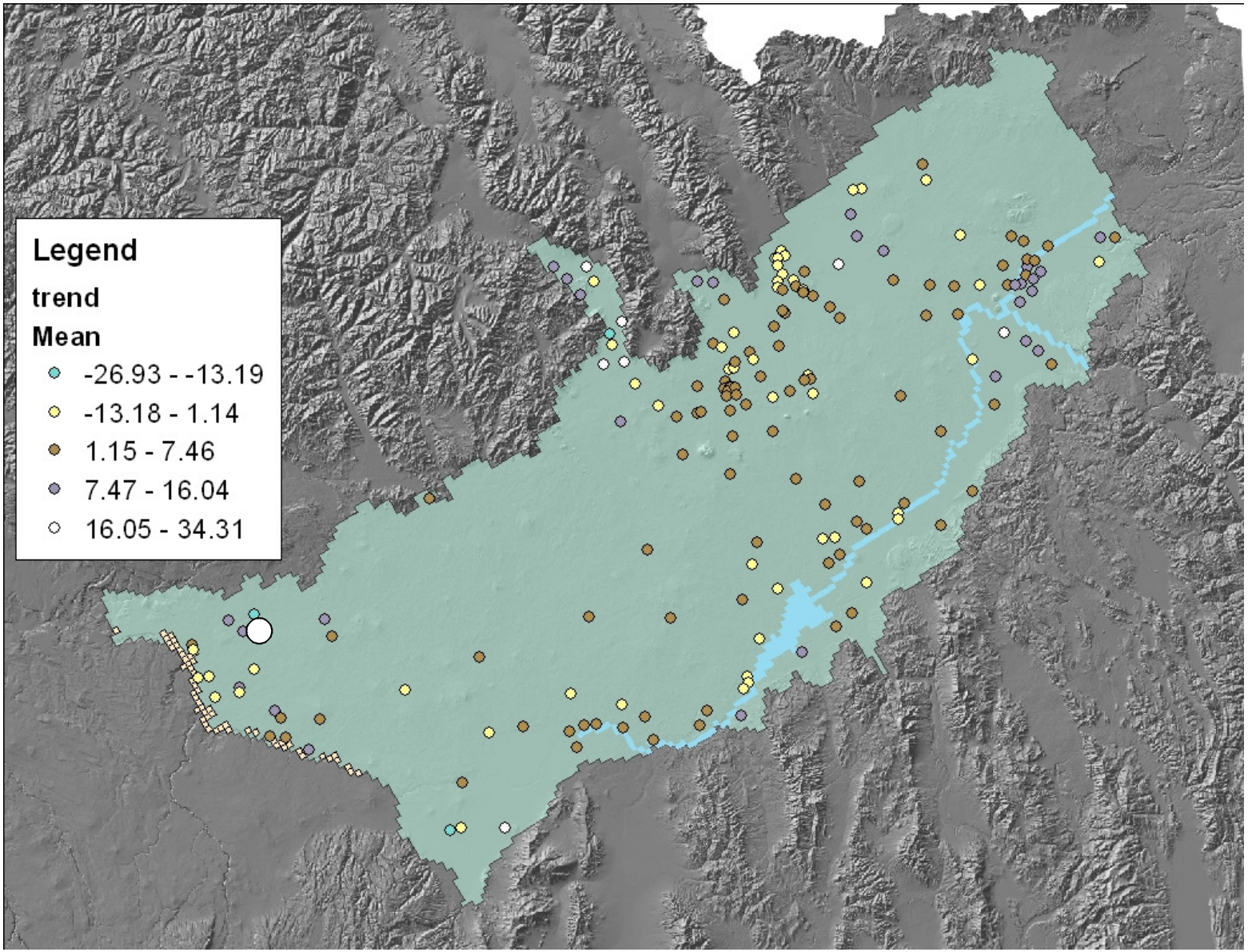

Legend
masmeas
Mean Residual ft
-82.28
-82.27 - -4.74
-4.73 - 0.18
0.19 - 6.13
6.14 - 35.77

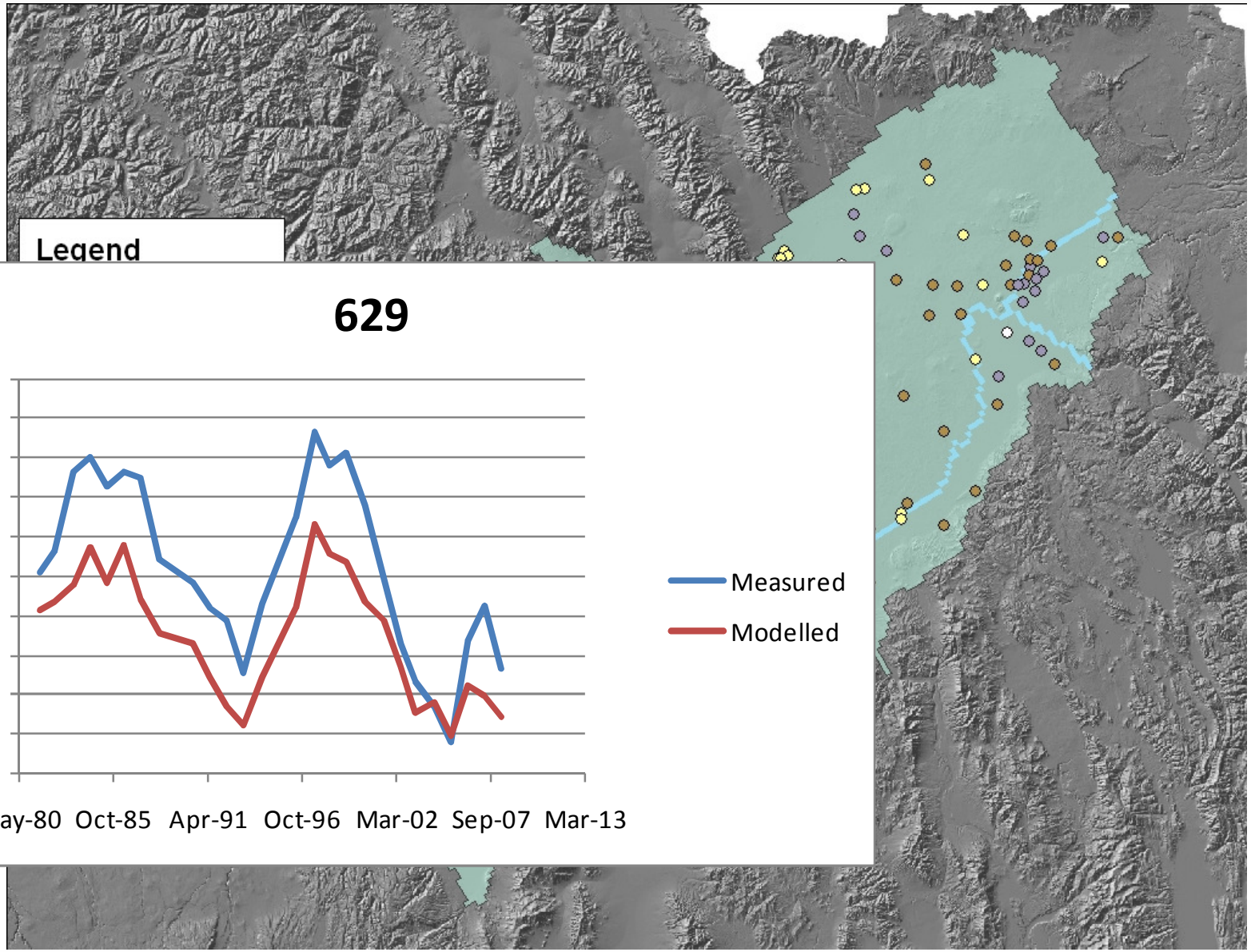

Legend
masmeas
Mean Residual ft
-82.28
-82.27 - -4.74
-4.73 - 0.18
0.19 - 6.13
6.14 - 35.77


1091
feet
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
May-80
Oct-85
Apr-91
Oct-96
Mar-02
Sep-07
Mar-13
Measured
Modelled



- Annual observations in wells


Legend
trend
Mean
-26.93 - -13.19
-13.18 - 1.14
1.15 - 7.46
7.47 - 16.04
16.05 - 34.31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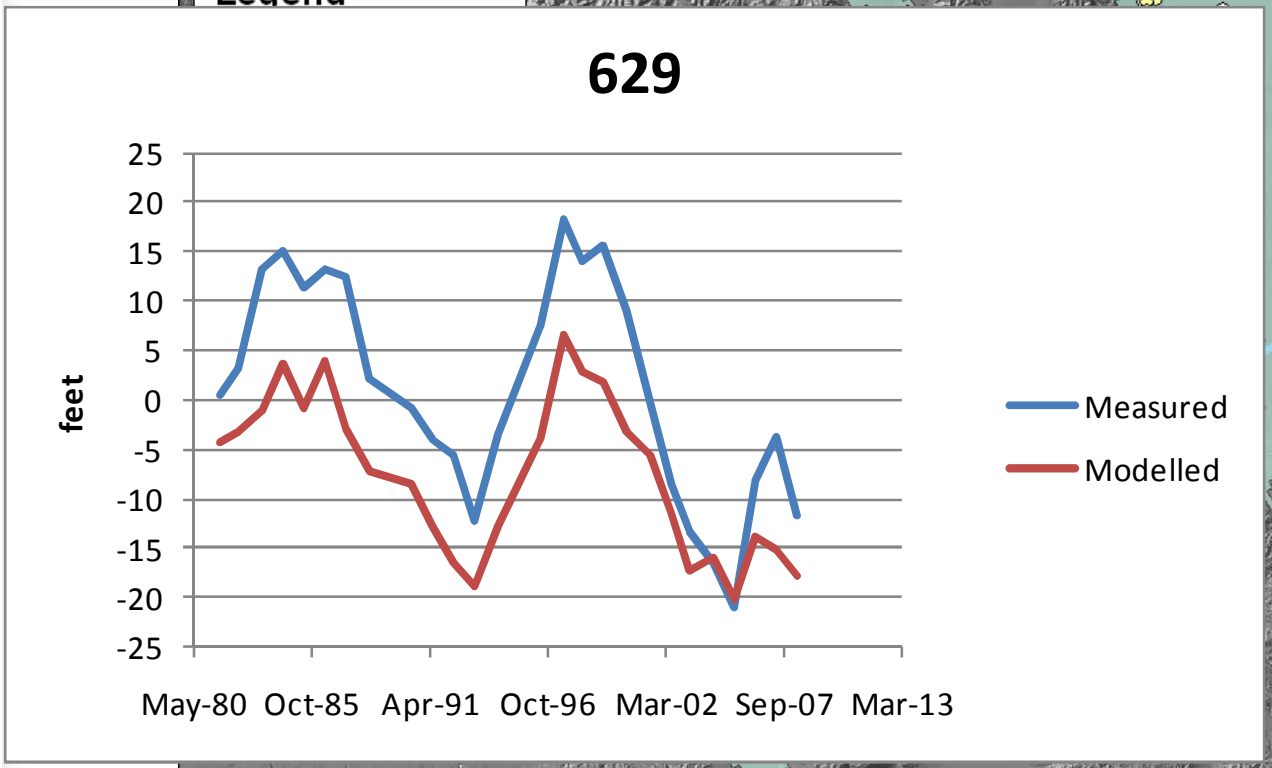
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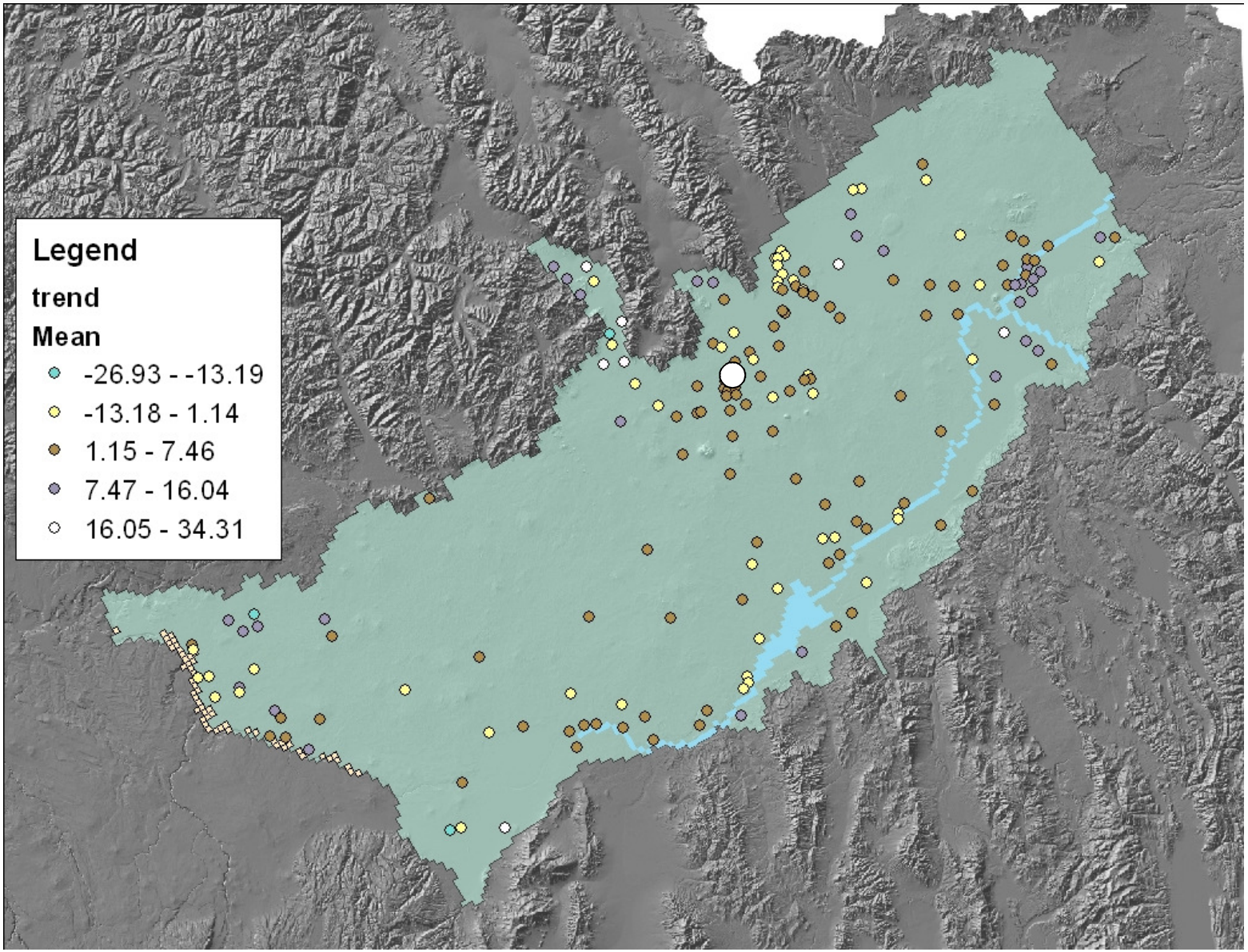
Apr-91
Oct-96
Mar-02
Sep-07
Mar-13
Measured
Modelled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trend
Mean
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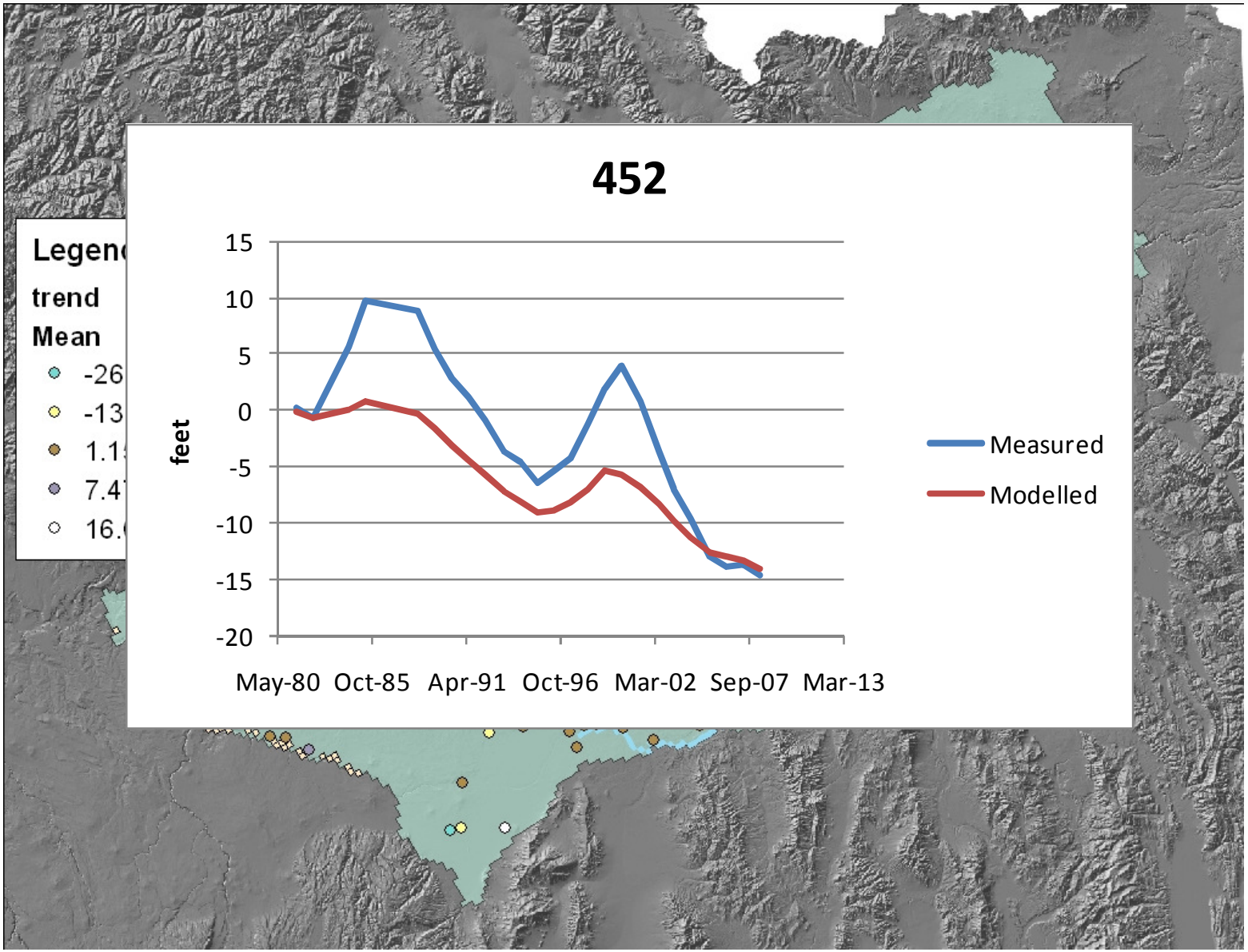
-13.18 - 1.14
1.15 - 7.46
7.47 - 16.04
16.05 - 34.31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trend
Mean
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-13
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16.
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15
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feet
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Oct-85
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Mar-02
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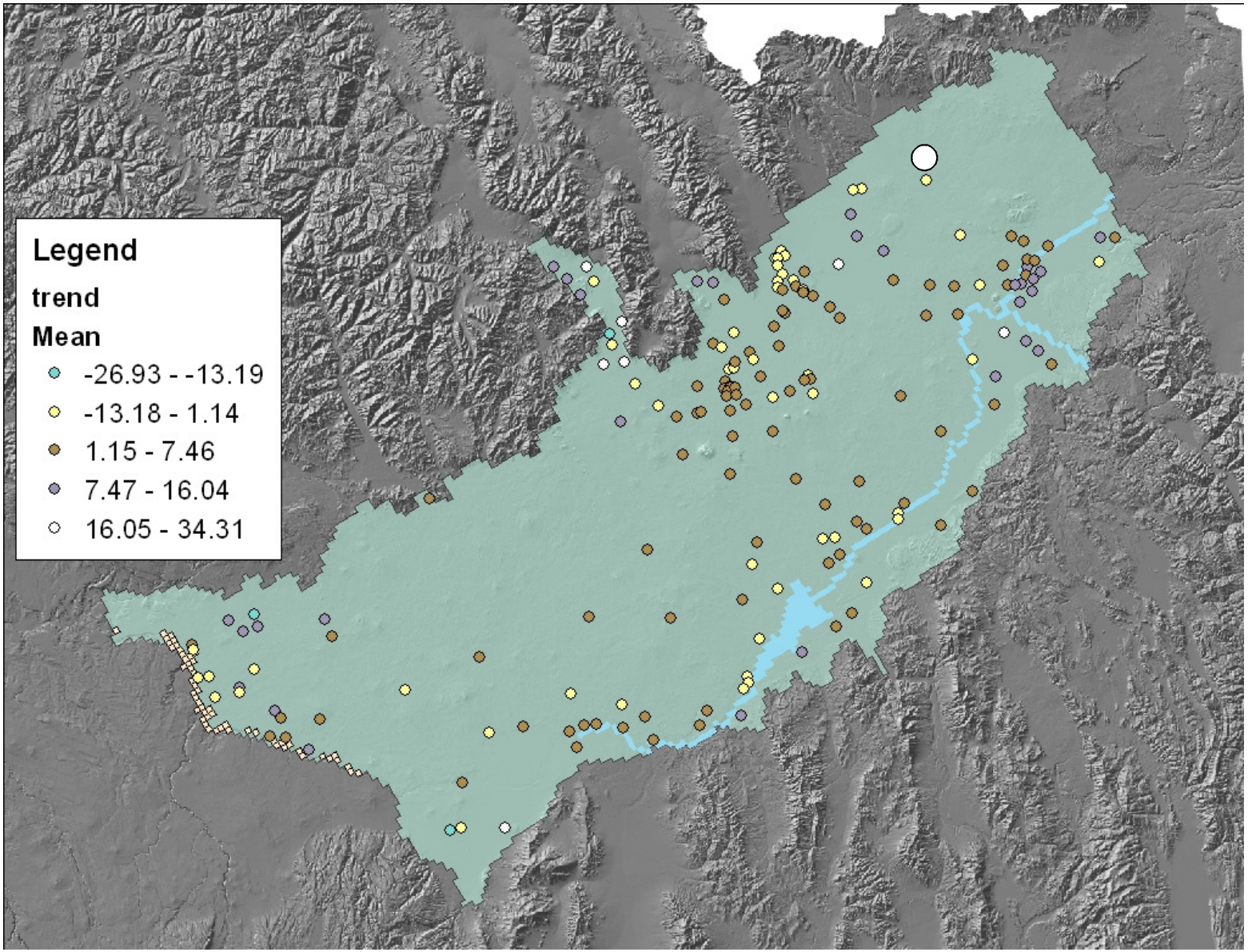
Mar-13
Measured
Modelled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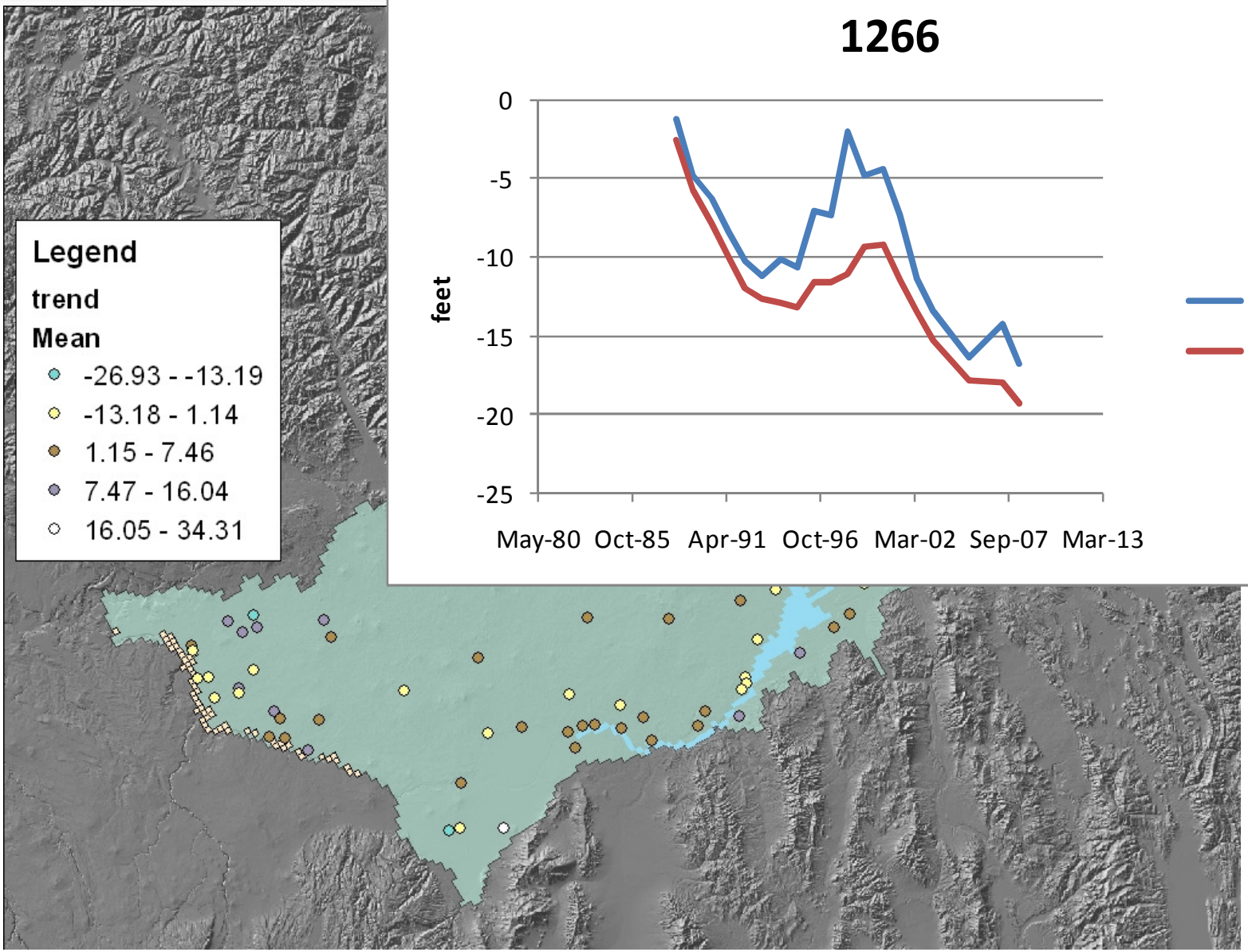
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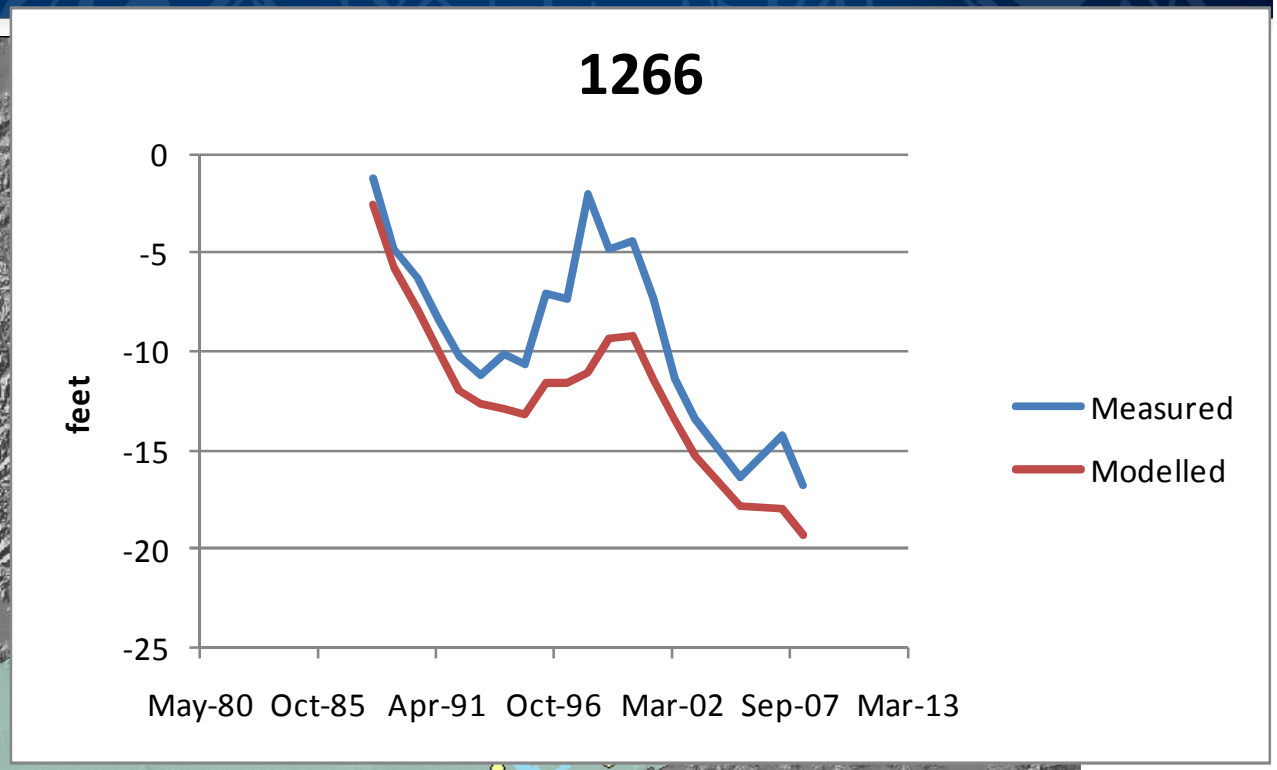
trend
Mean
-26.93 - -13.19
-13.18 - 1.14
1.15 - 7.46
7.47 - 16.04
16.05 - 34.31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feet
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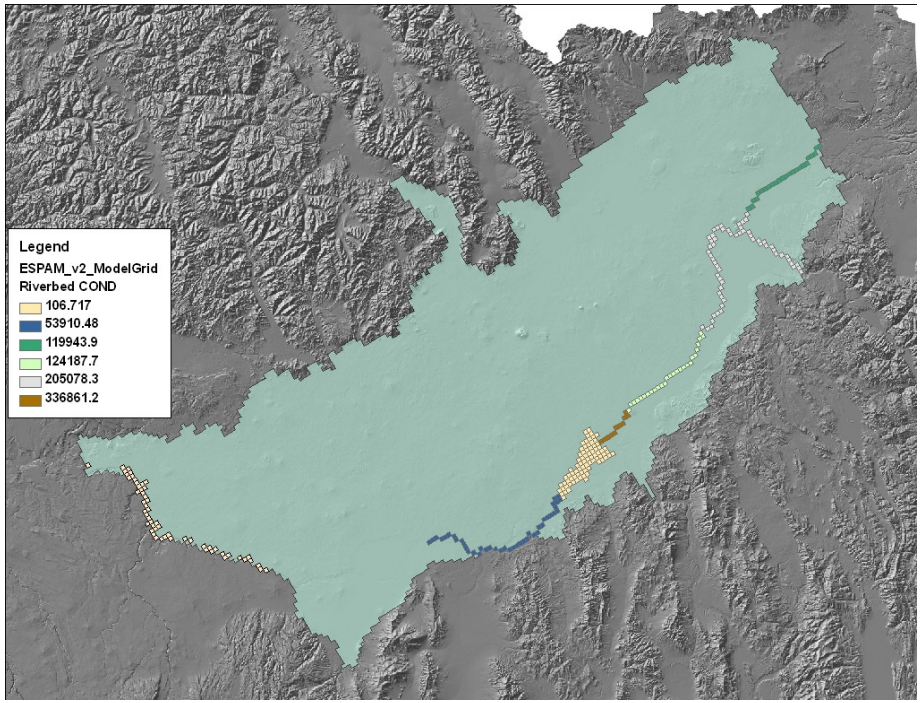
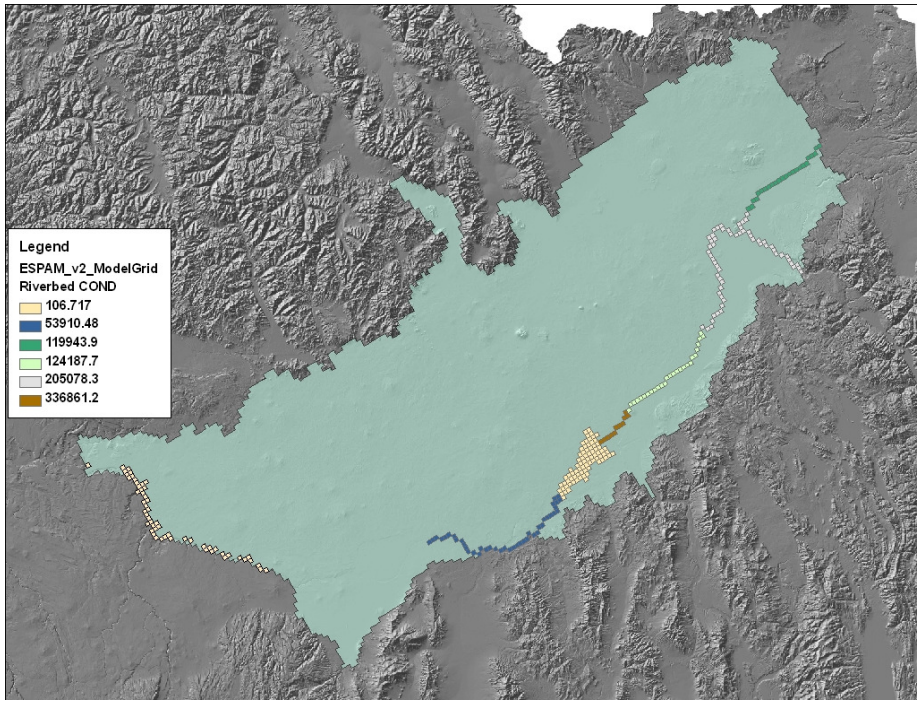
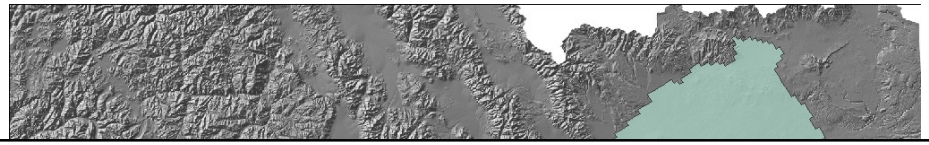
Mar-13
Measured
Modelled



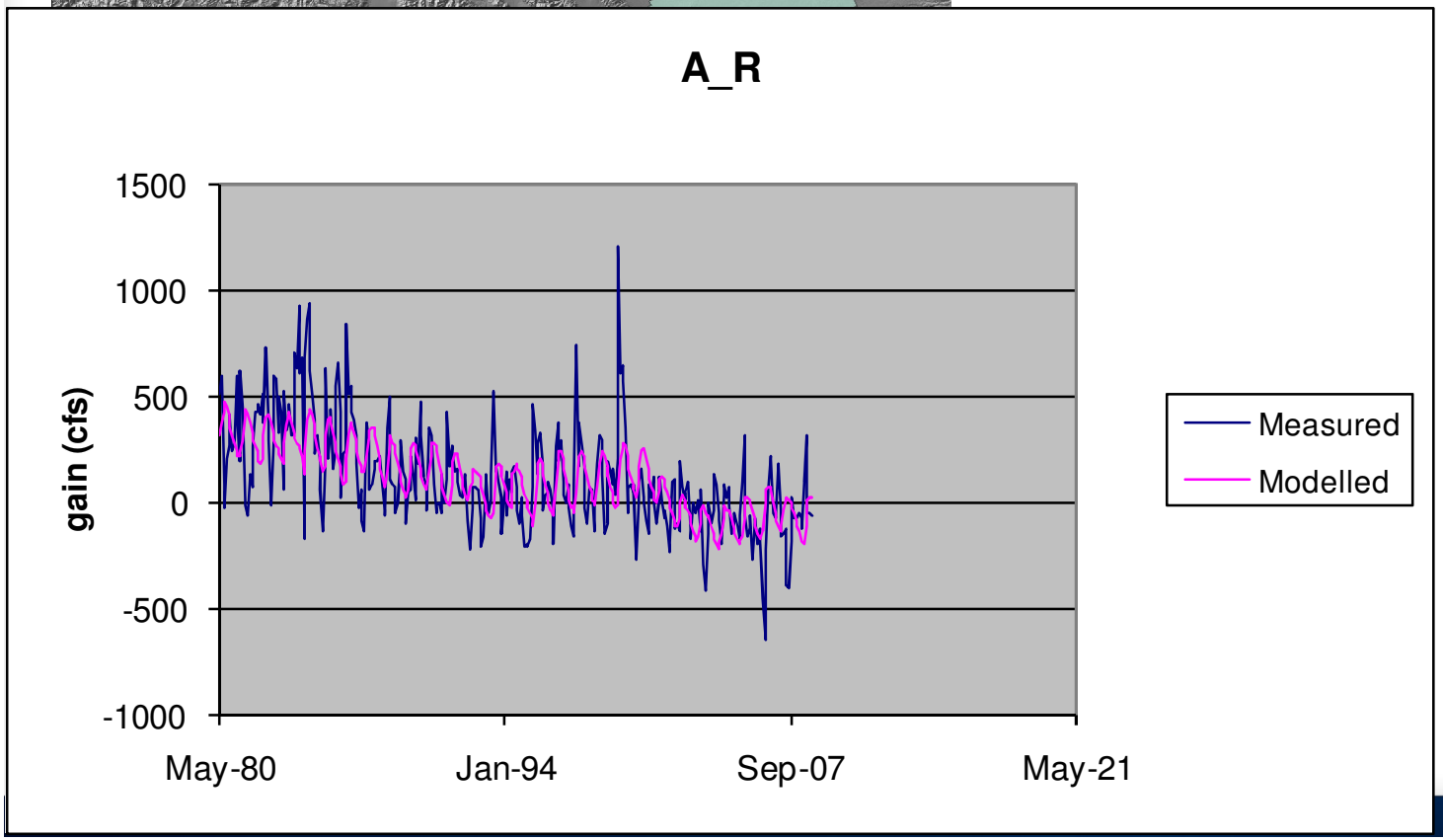
- Snake River reaches

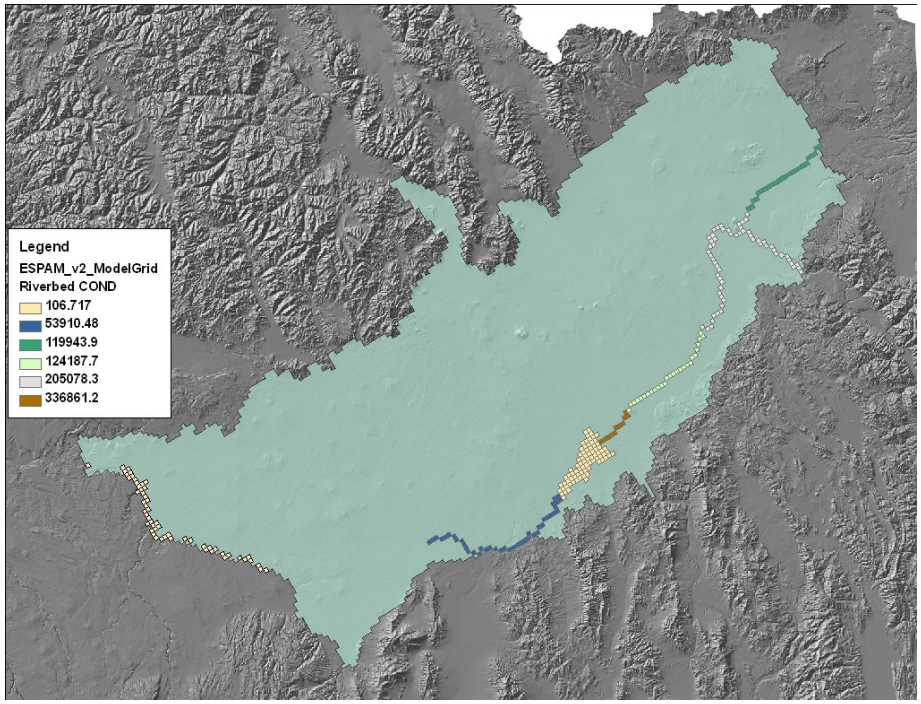


- Ashton to Rexburg

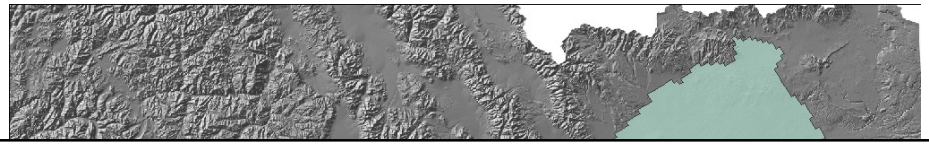


- Ashton to Rexburg

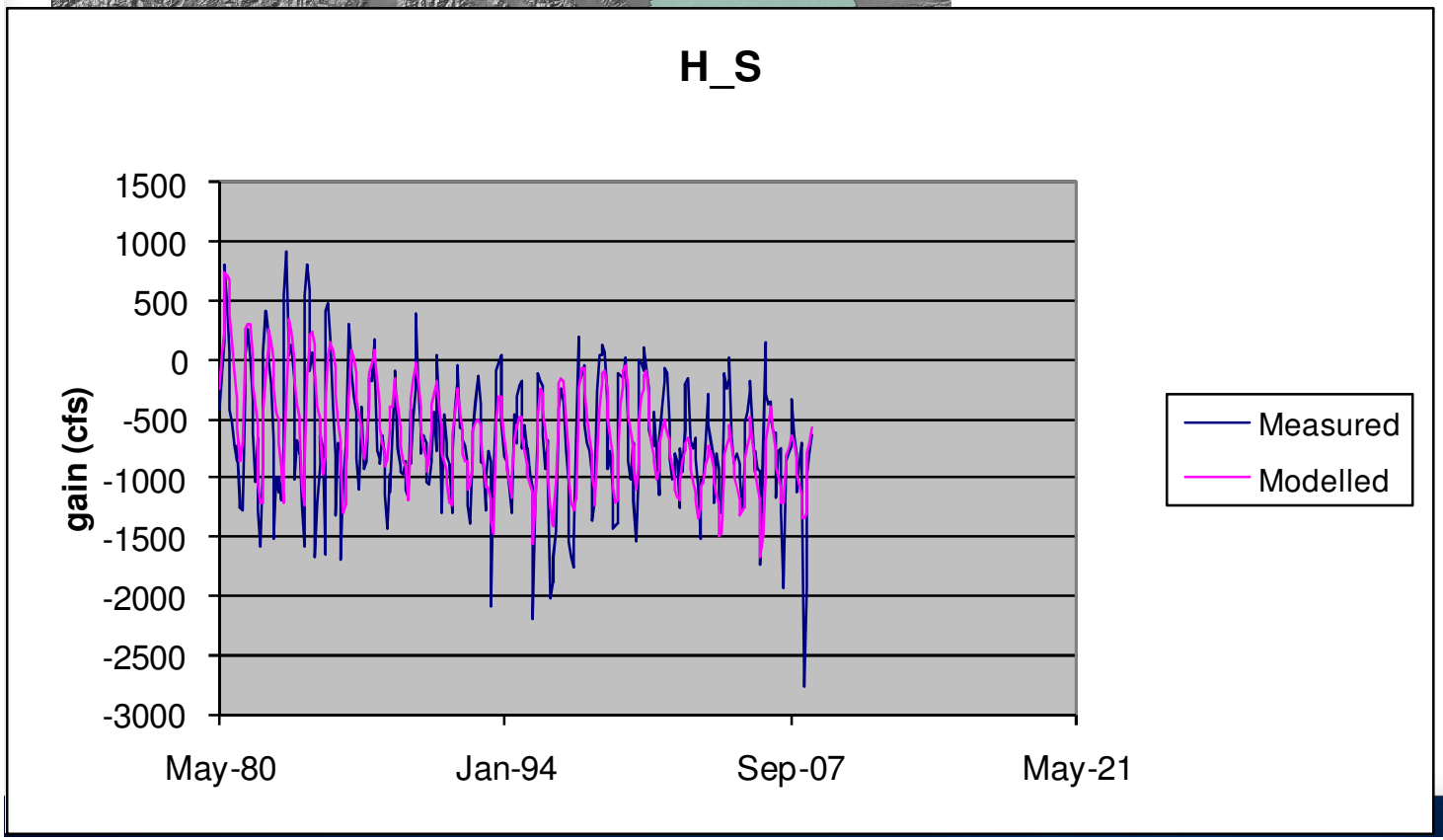


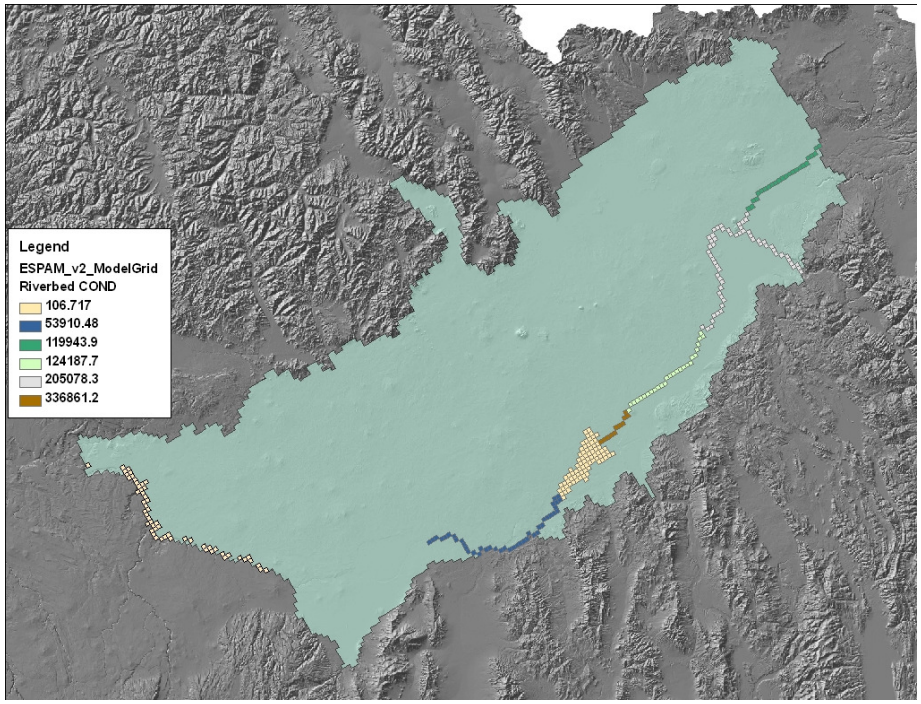


- Heise to Shelly

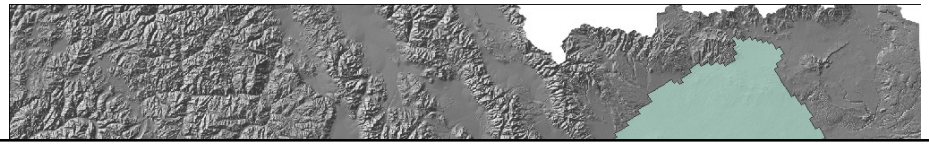


- Heise to Shelly

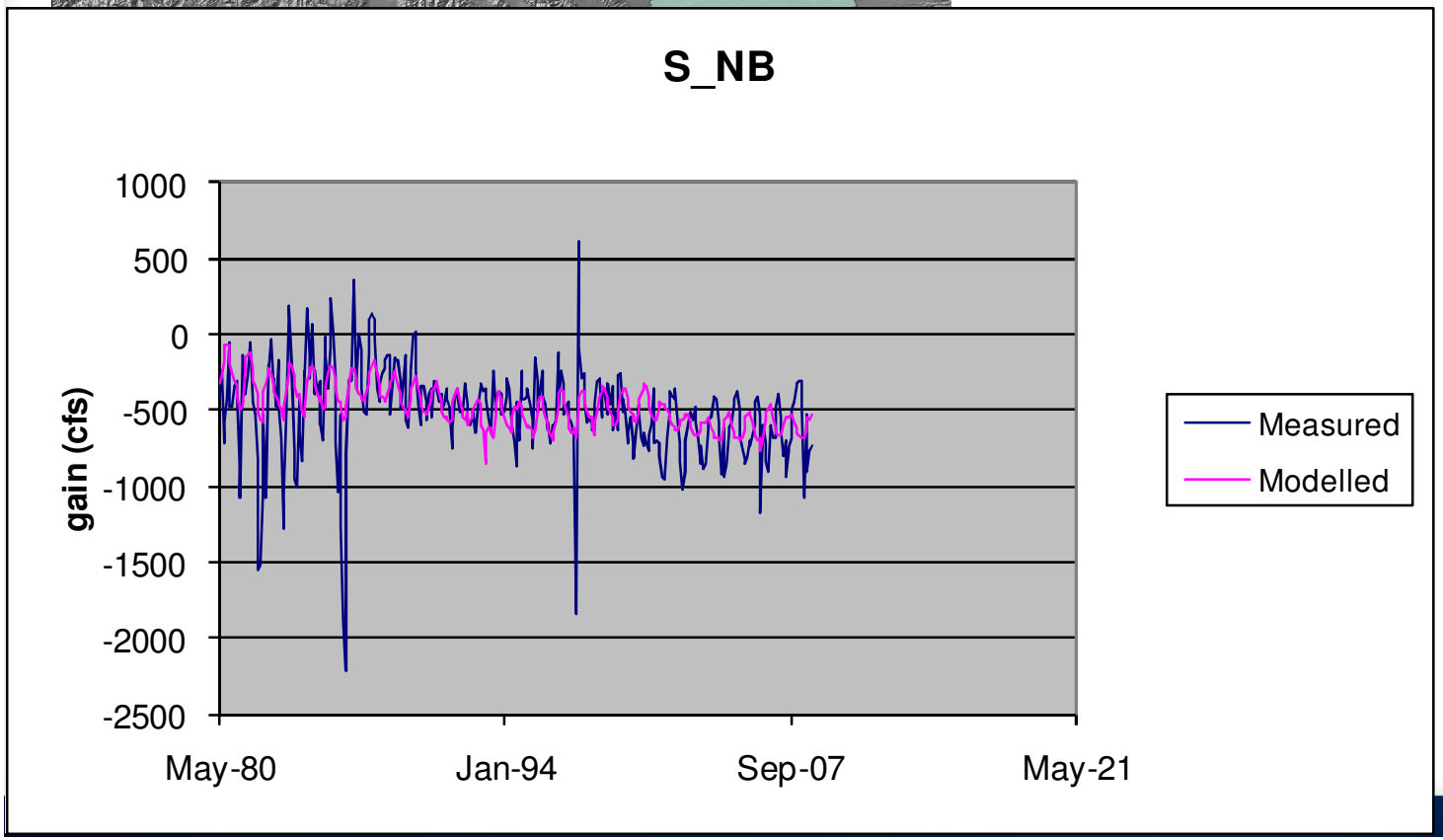


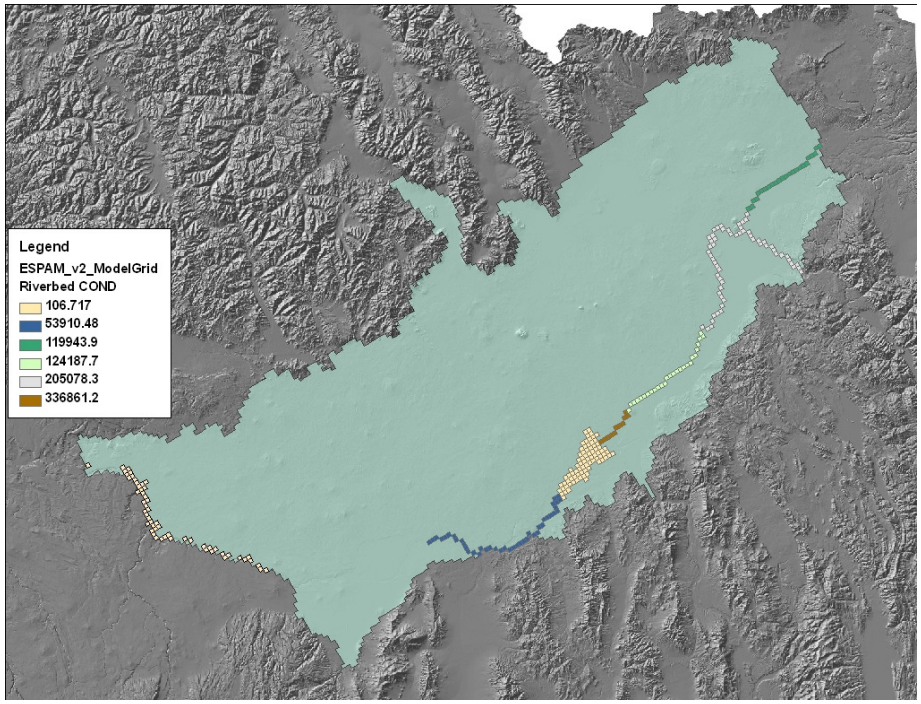


- Shelly – nr Blackfoot

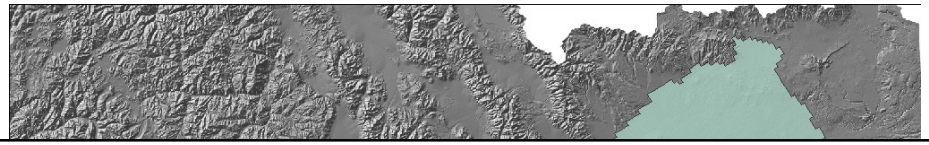


- Shelly – nr Blackfoot

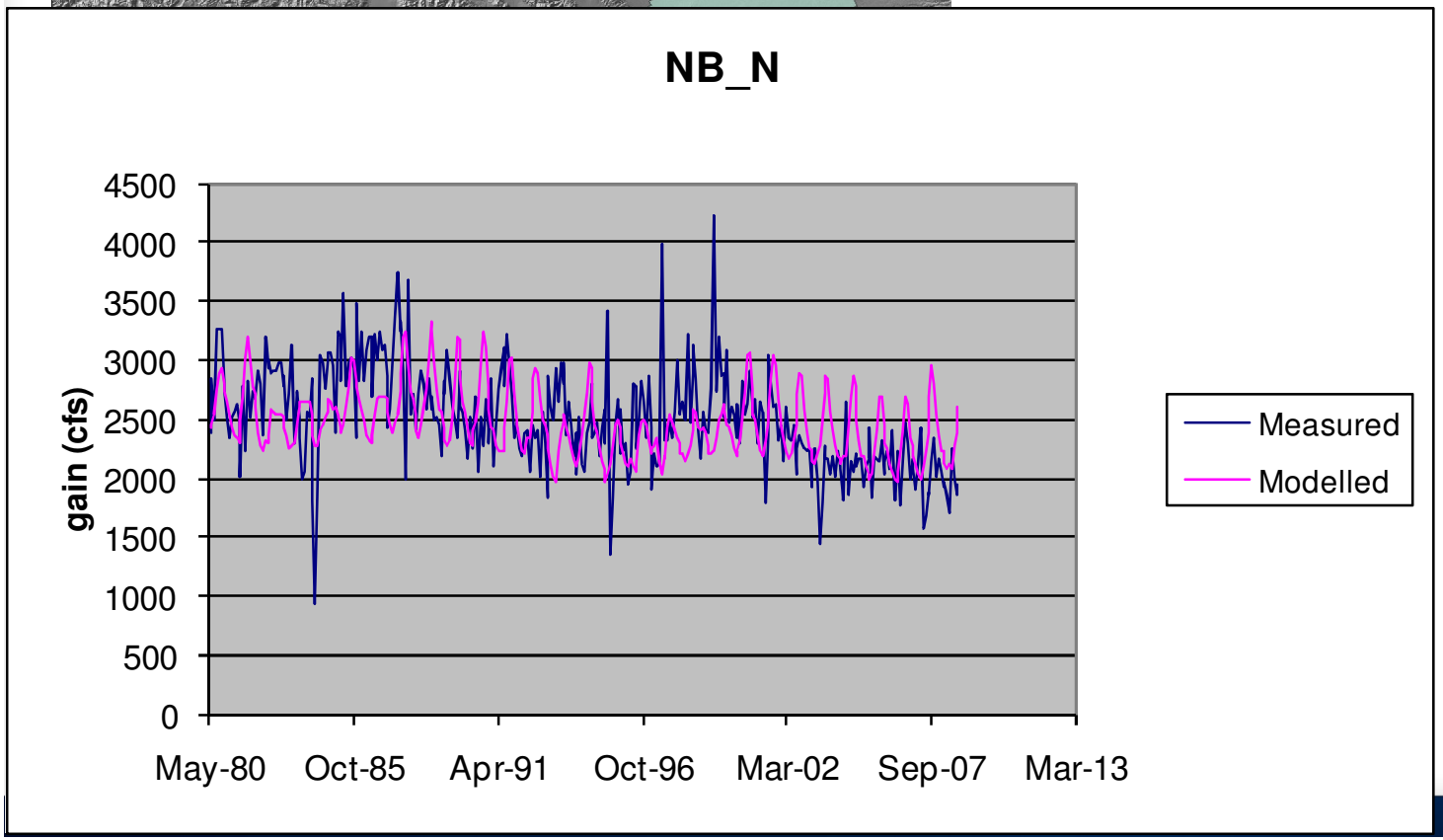


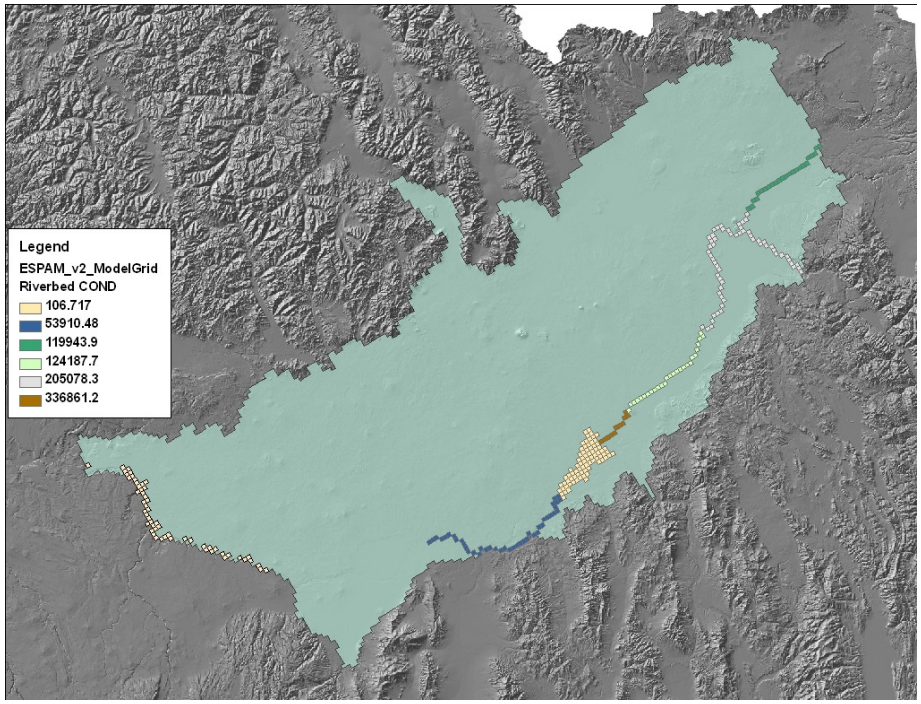


- Nr Blackfoot – Neeley

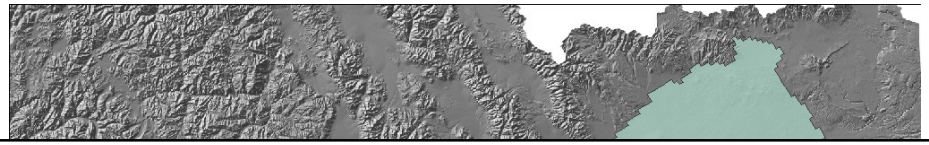


- Nr Blackfoot – Neeley

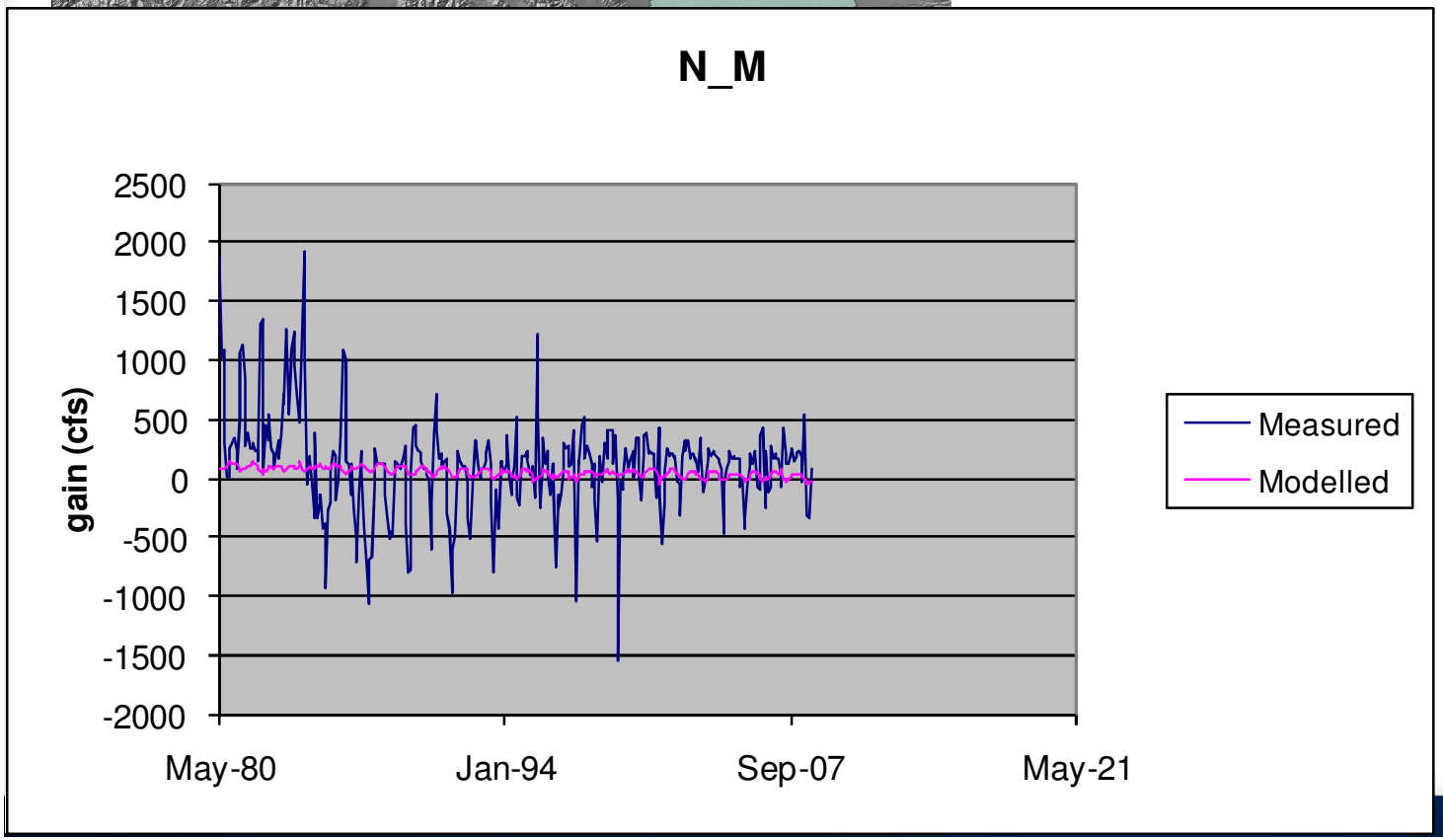


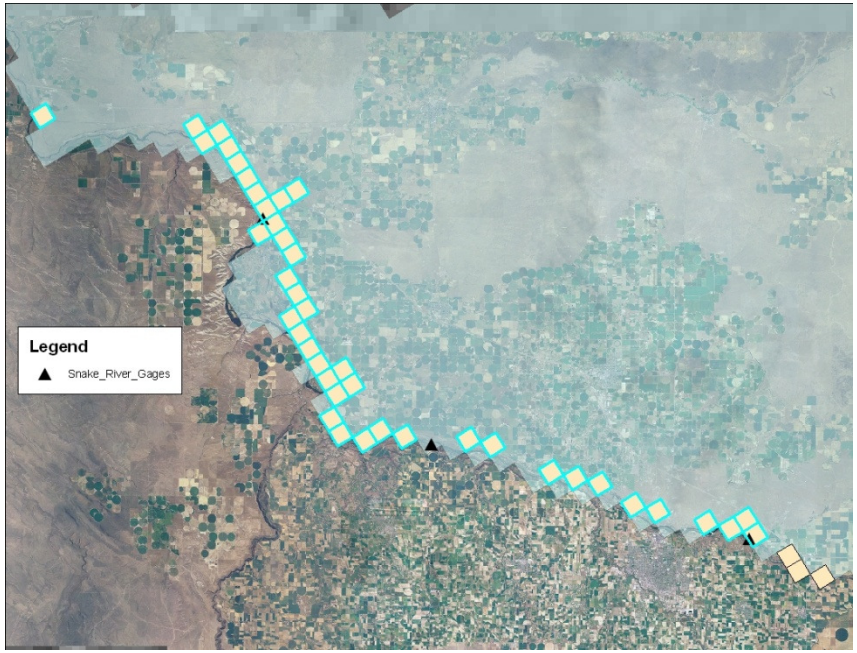


- Neeley - Minidoka



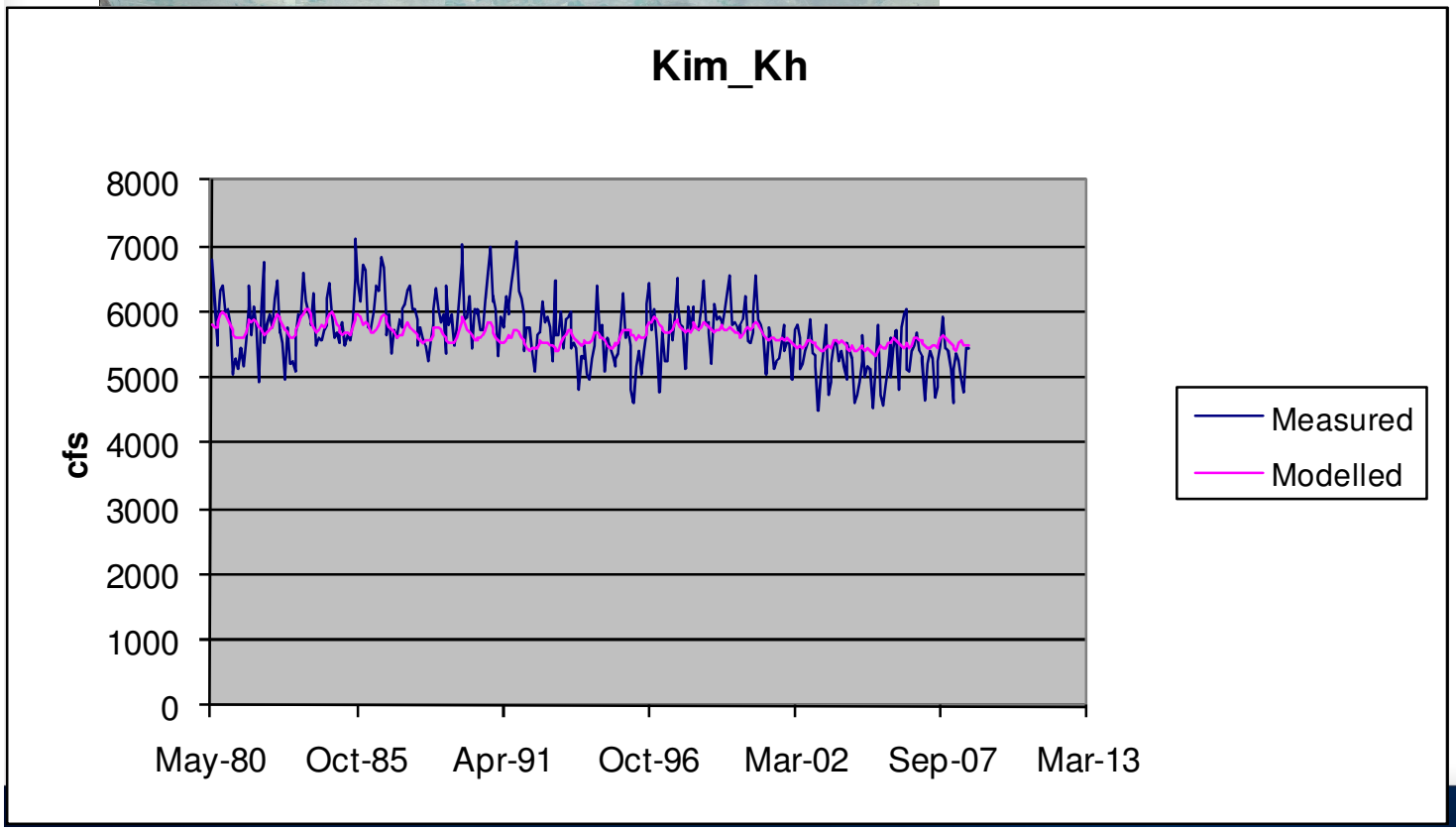
- Neeley - Minidoka

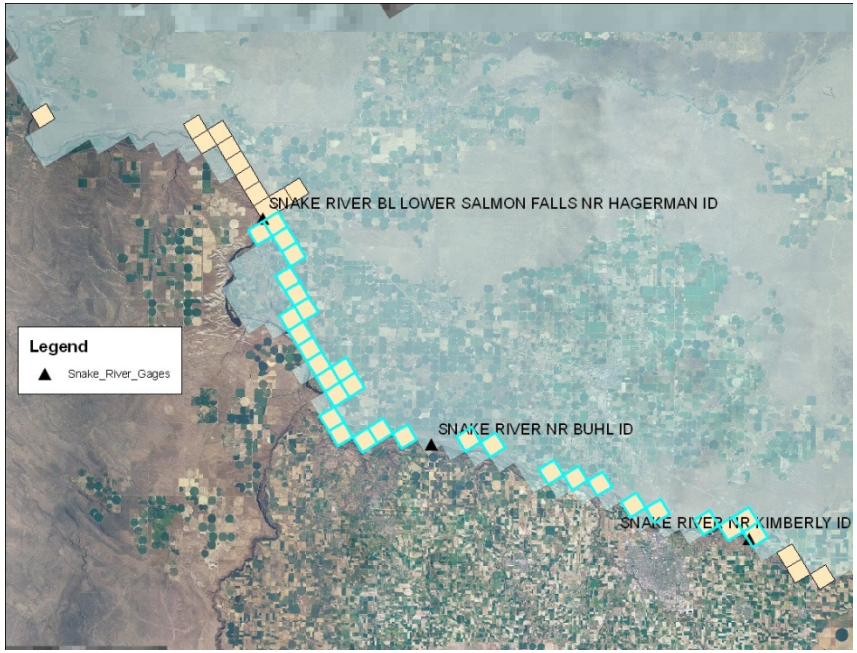




- Kimberly-King Hill

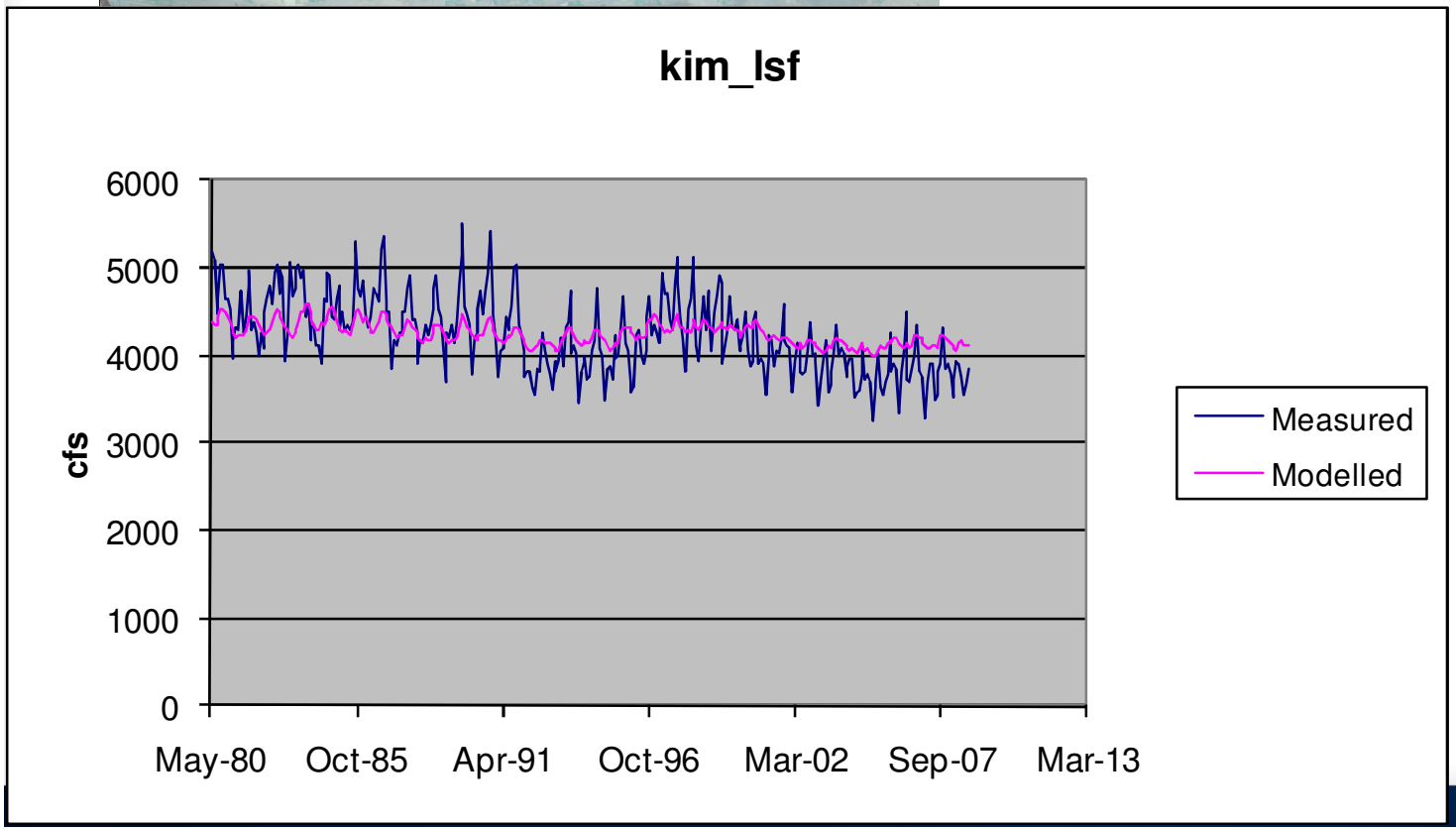
- Kimberly-King Hill

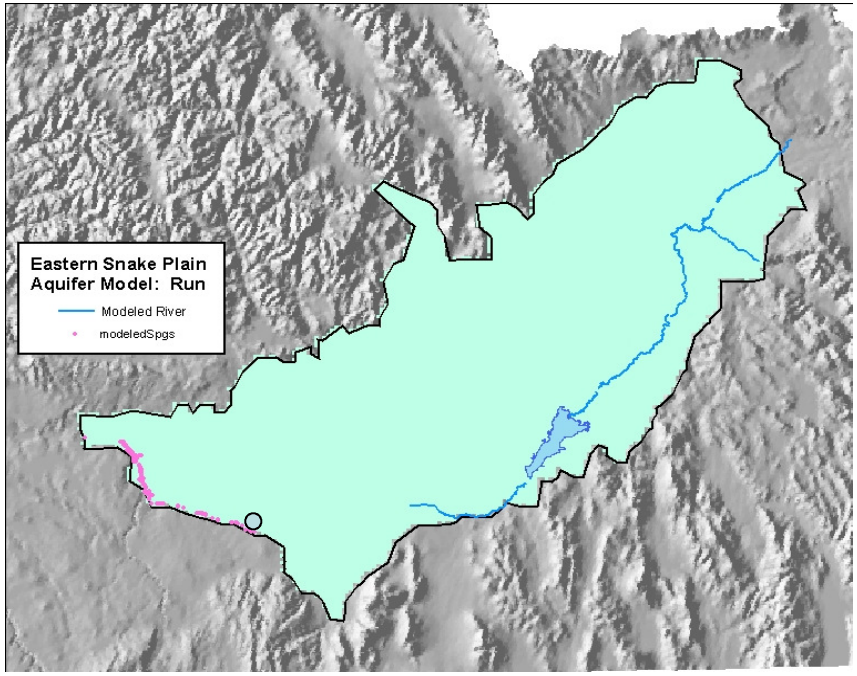




- Kimberly-Lower Salmon Falls

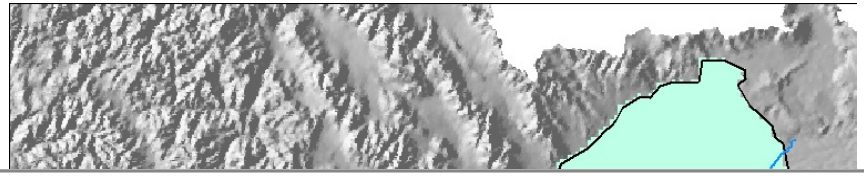
- Kimberly-Lower Salmon Falls

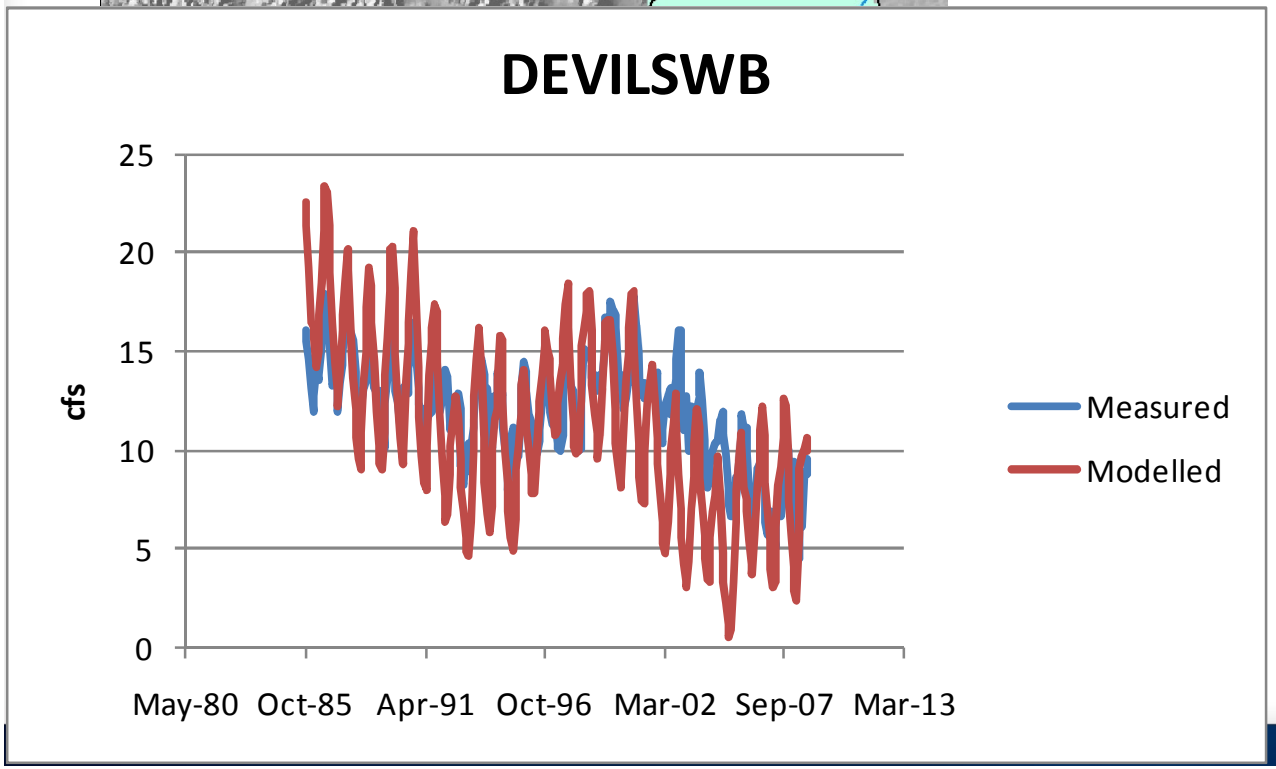


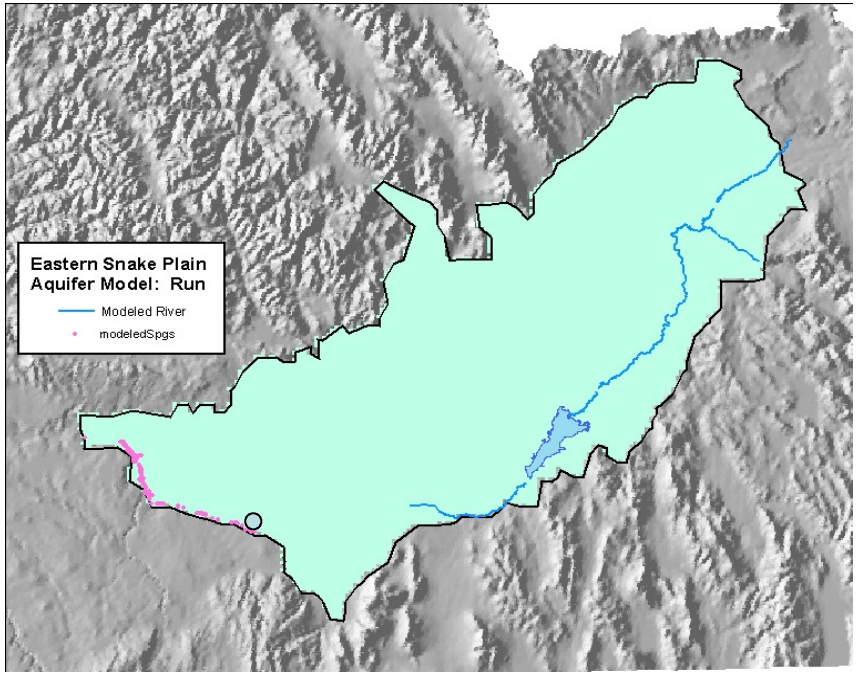


- Devils Washbowl

- Devils Washbowl

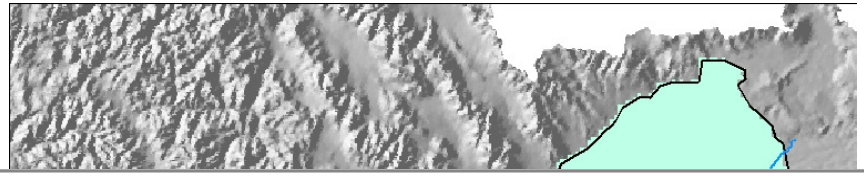


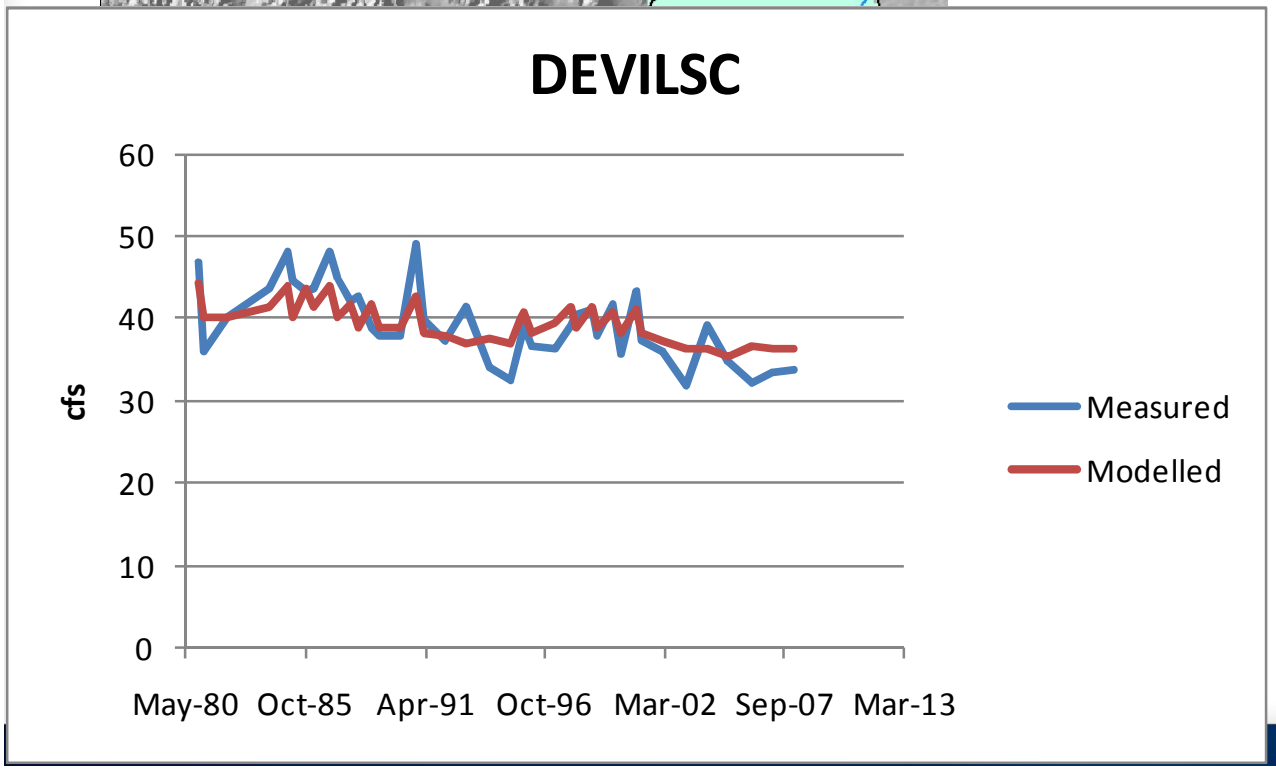


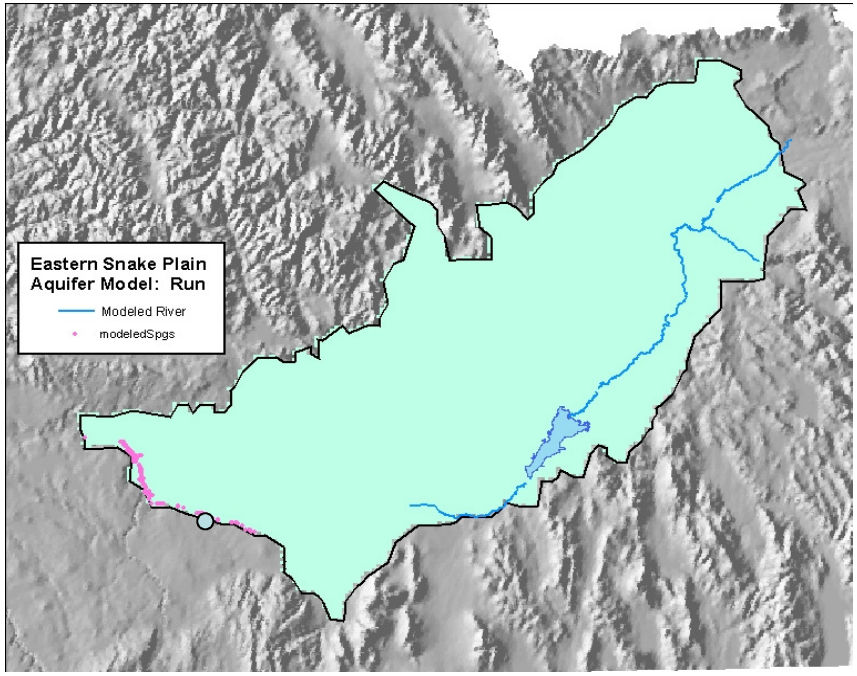


- Devils Corral

- Devils Corral

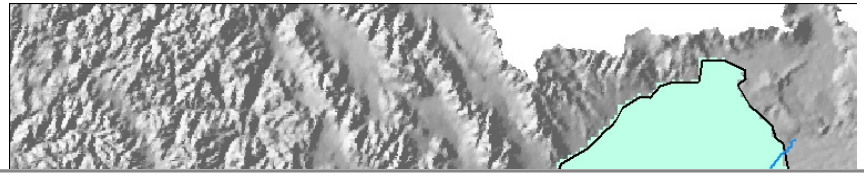


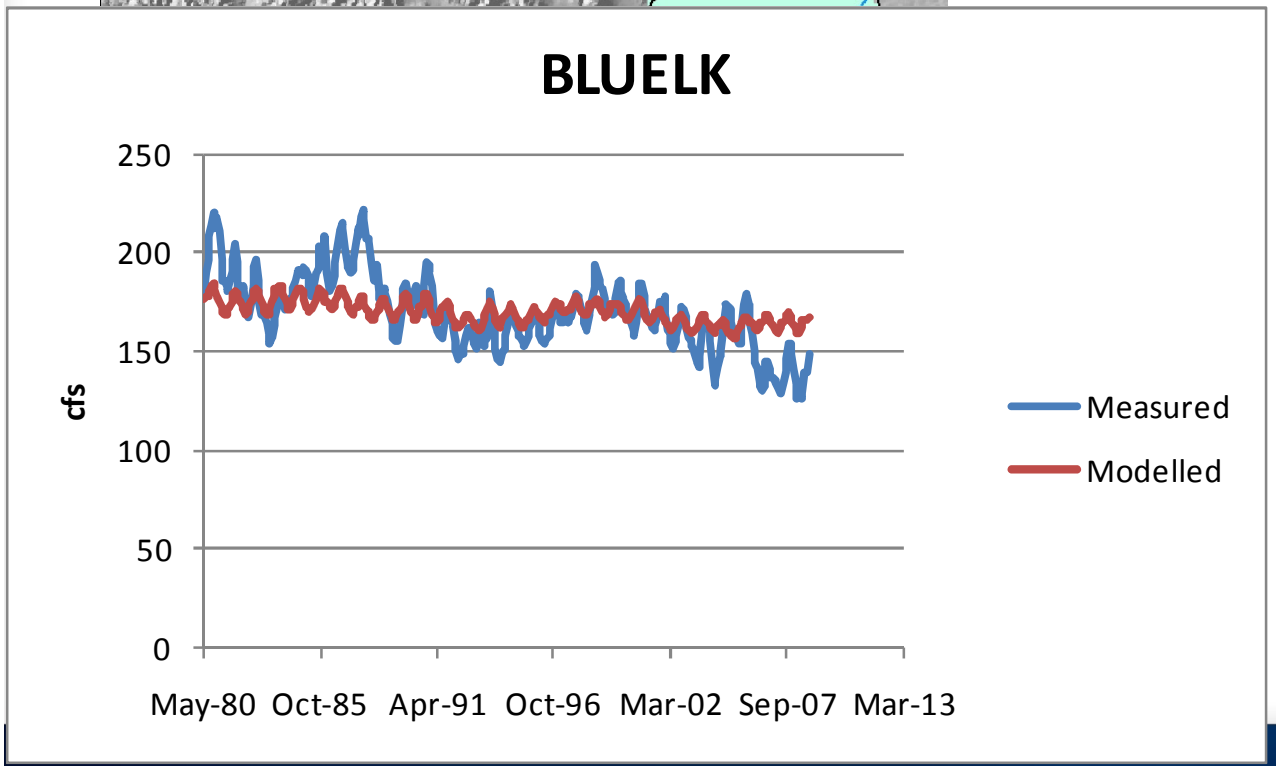


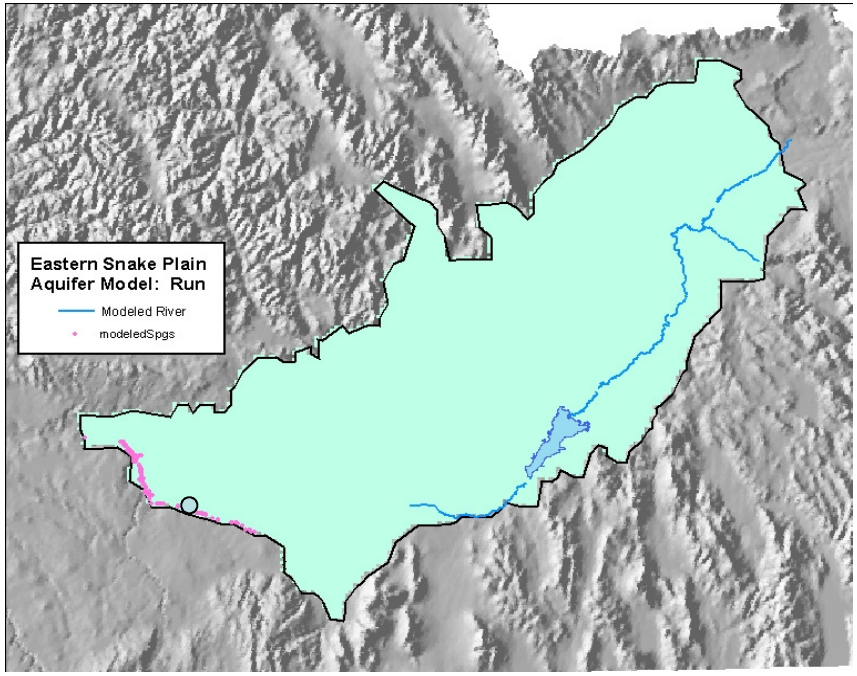

Eastern Snake Plain
Aquifer Model: Run
Modeled River
modeledSpgs

- Blue Lakes

- Blue Lakes

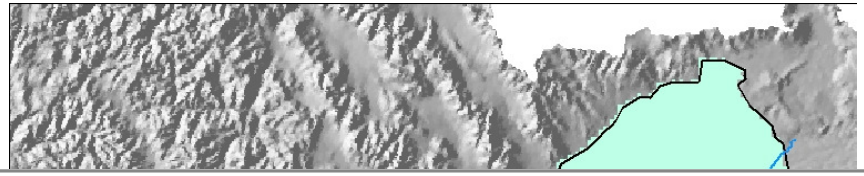


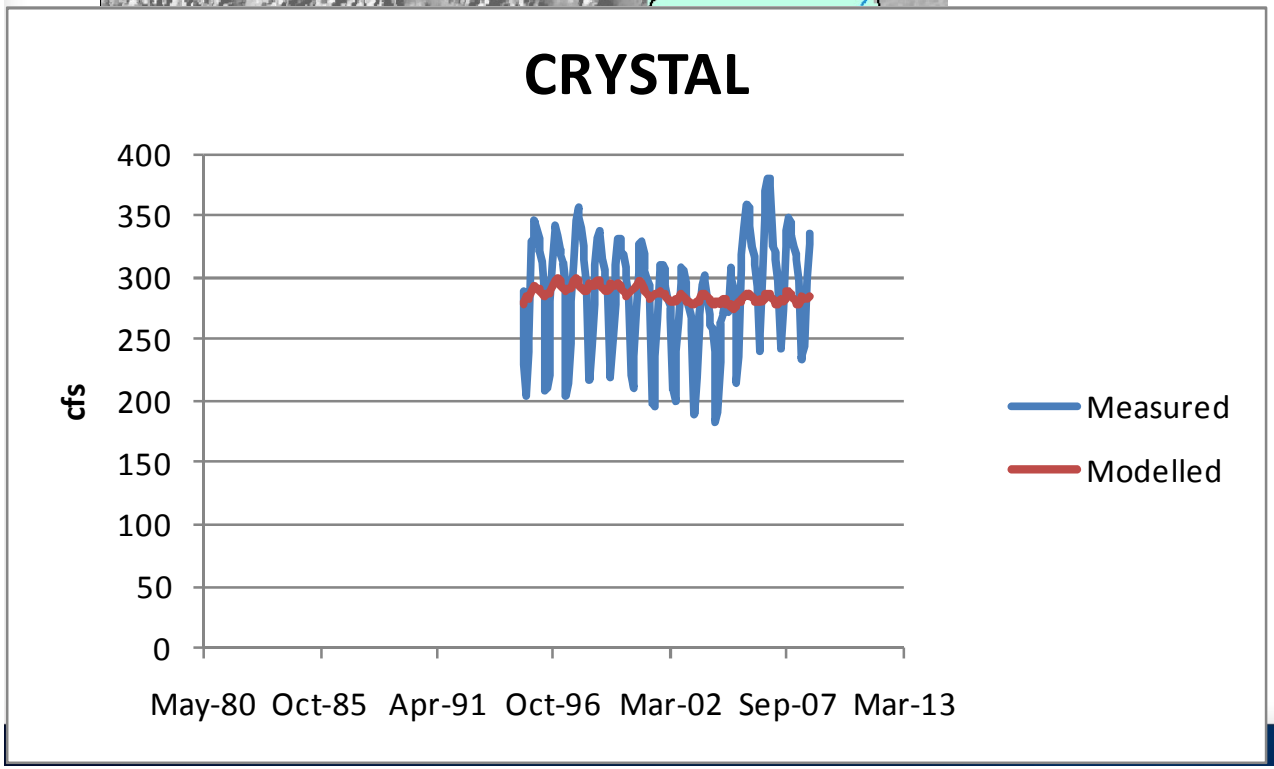

BLUELK
250
200
150
100
50
0
cfs
May-80
Oct-85
Apr-91
Oct-96
Mar-02
Sep-07
Mar-13
Measured
Modelled

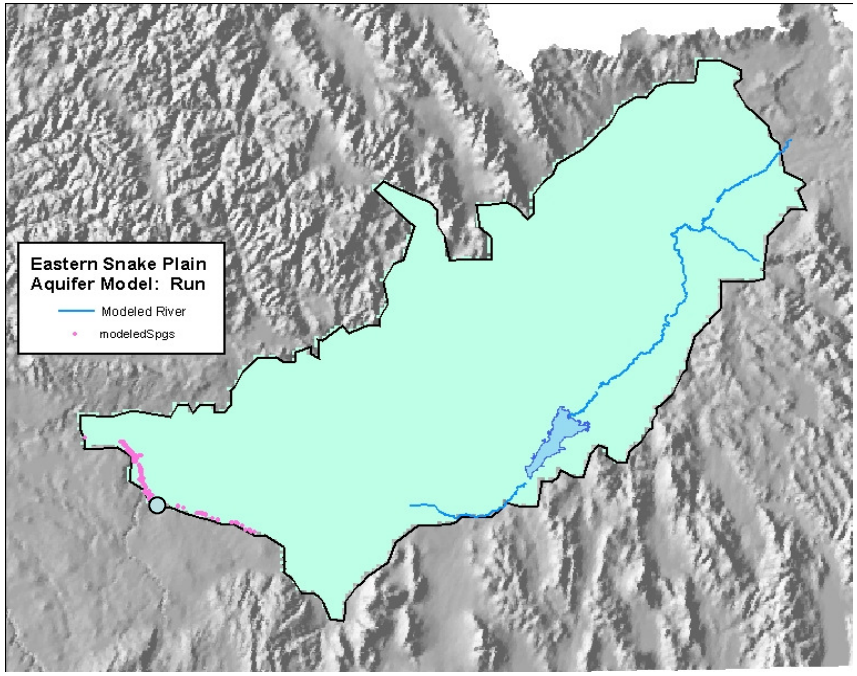


- Crystal Springs

- Crystal Springs

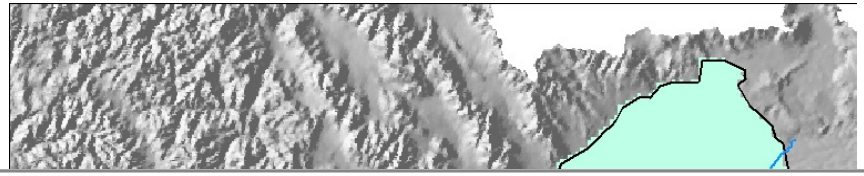


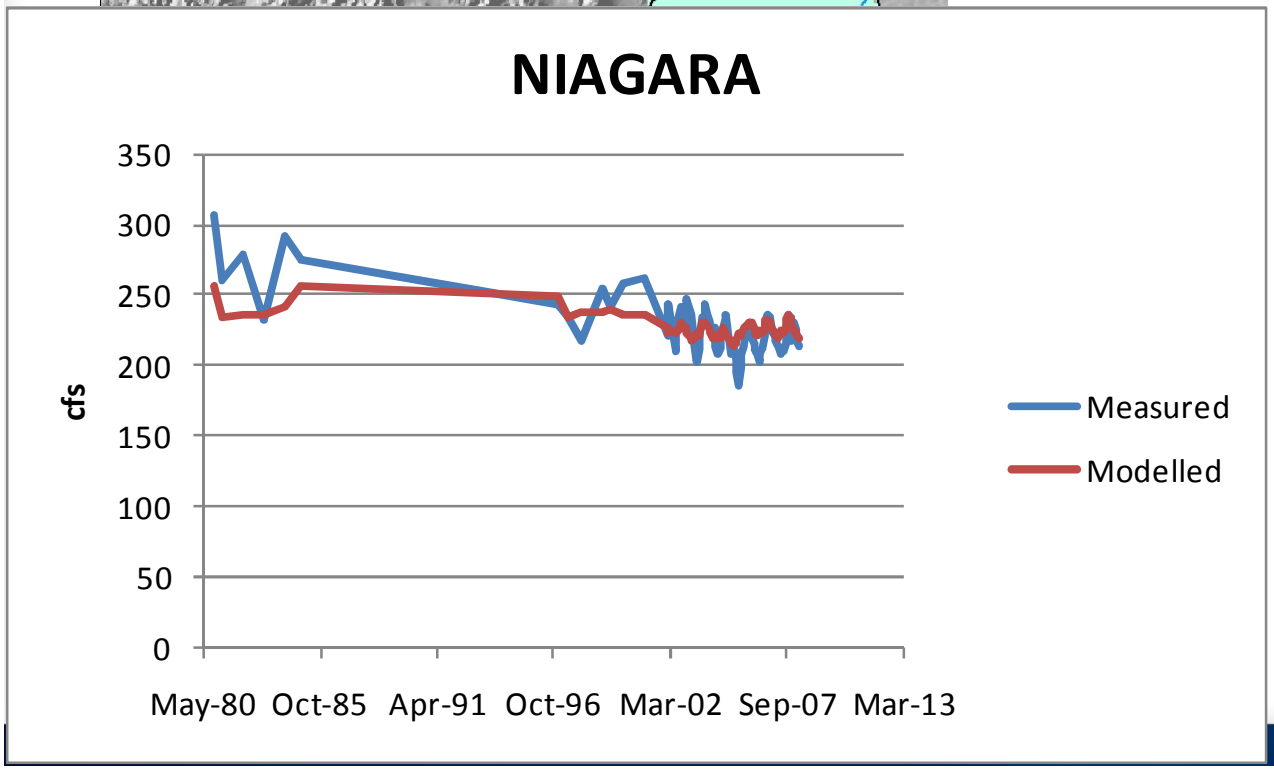



Eastern Snake Plain
Aquifer Model: Run
Modeled River
modeledSpgs

- Niagara

- Niagara




NIAGARA
cfs
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300
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200
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50
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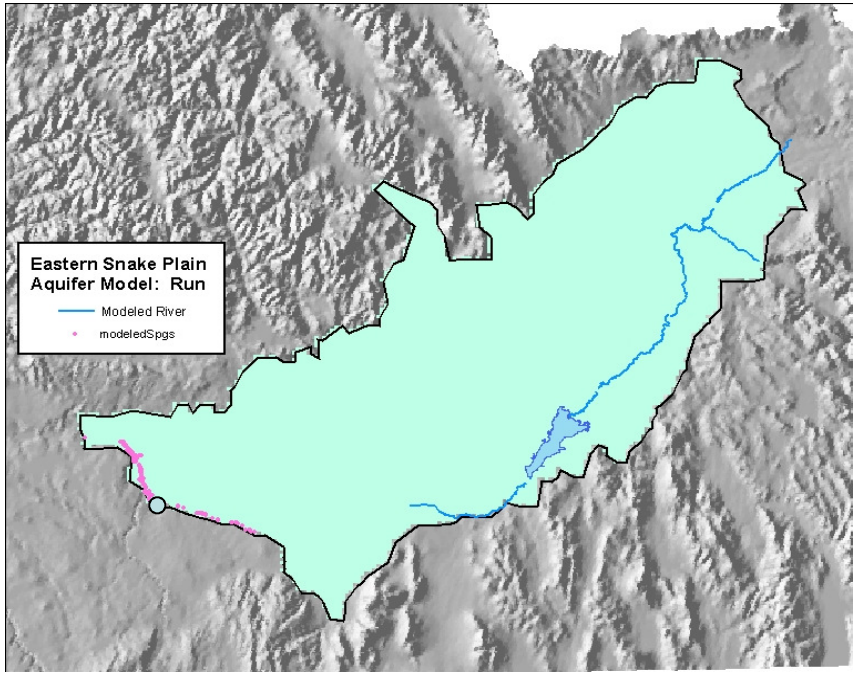
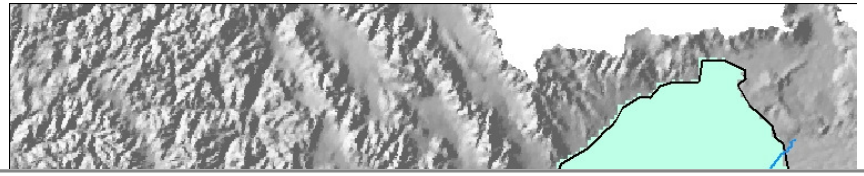
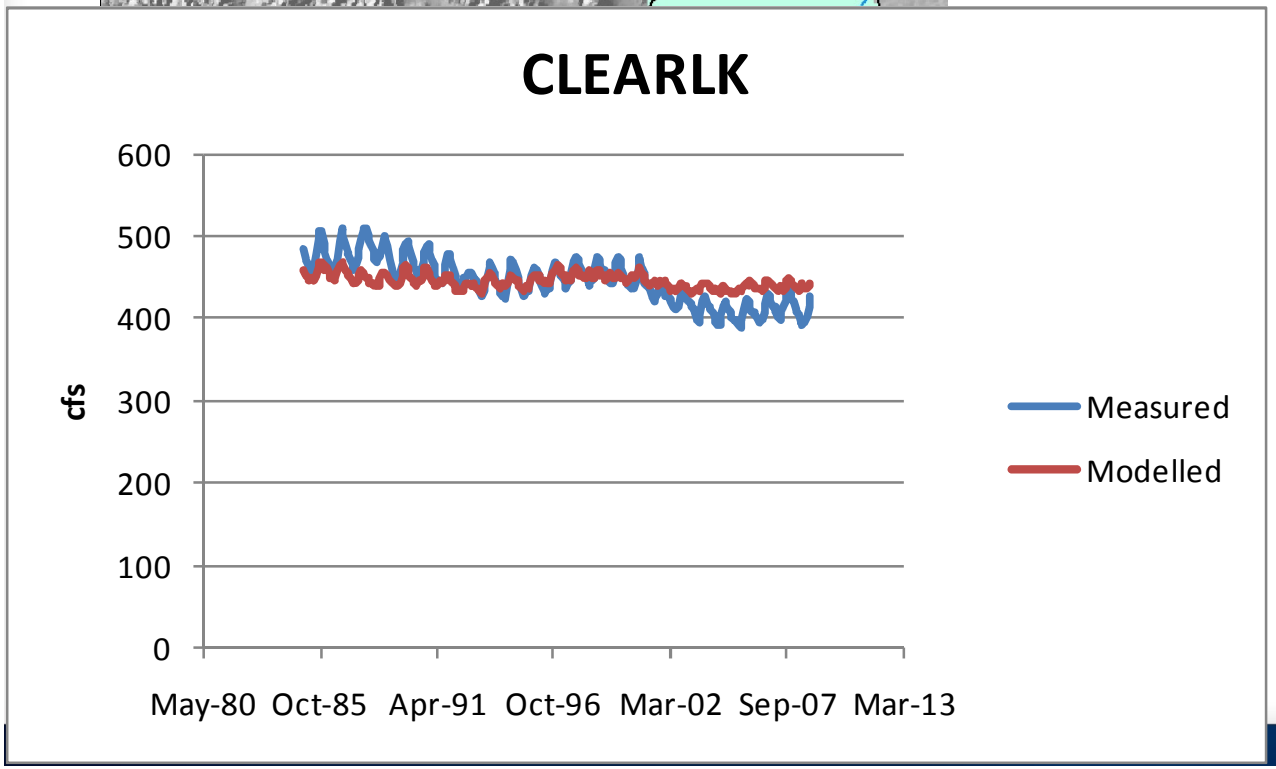
May-80
Oct-85
Apr-91
Oct-96
Mar-02
Sep-07
Mar-13
Measured
Modelled


Eastern Snake Plain
Aquifer Model: Run
Modeled River
modeledSpgs

- Clear Lakes

- Clear Lakes




CLEARLK
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May-80
Oct-85
Apr-91
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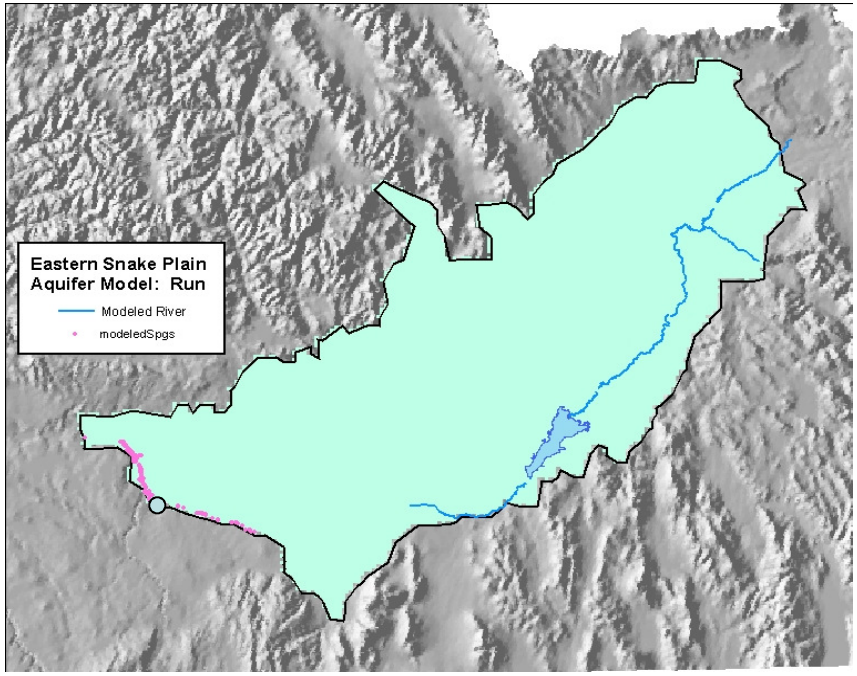
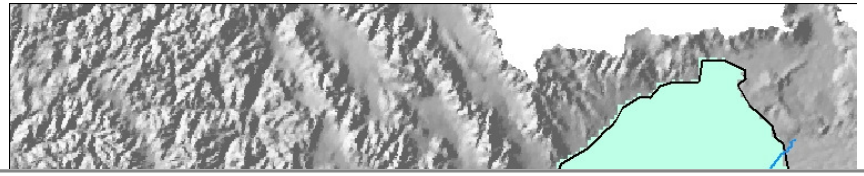
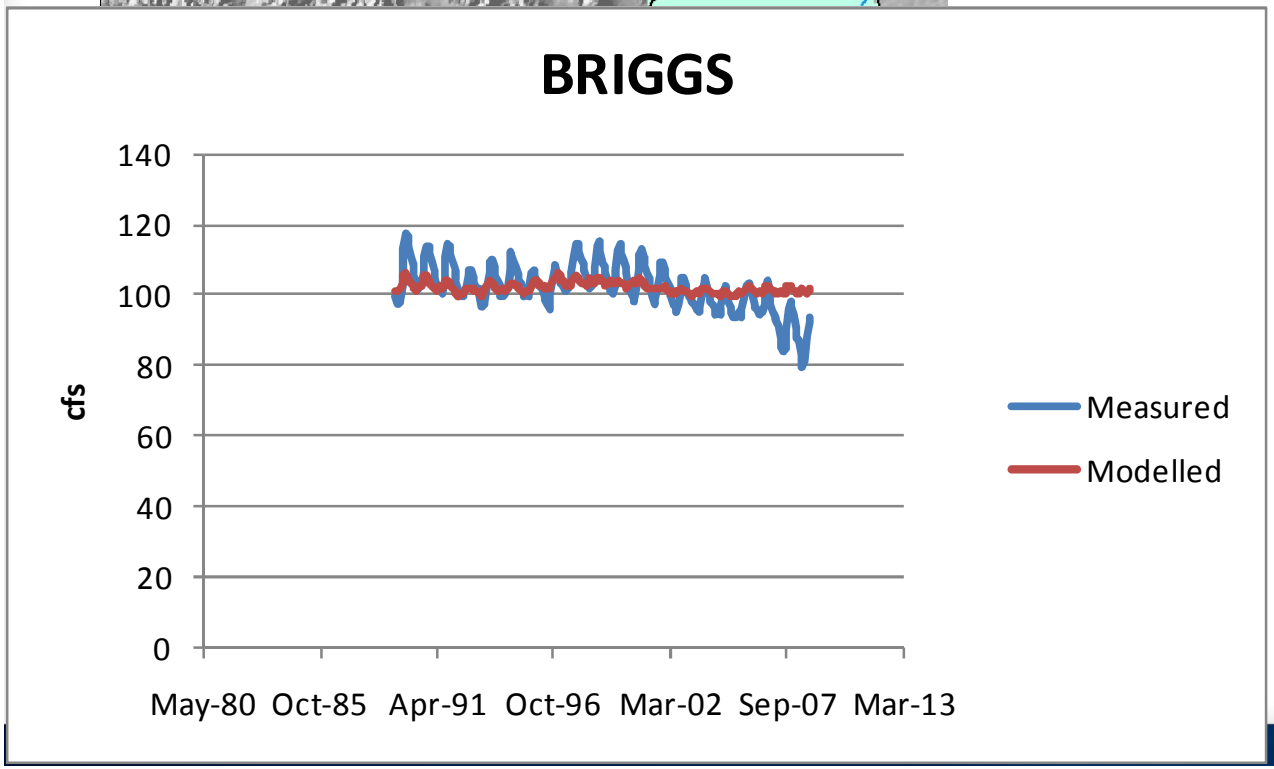
Mar-02
Sep-07
Mar-13
Measured
Modelled

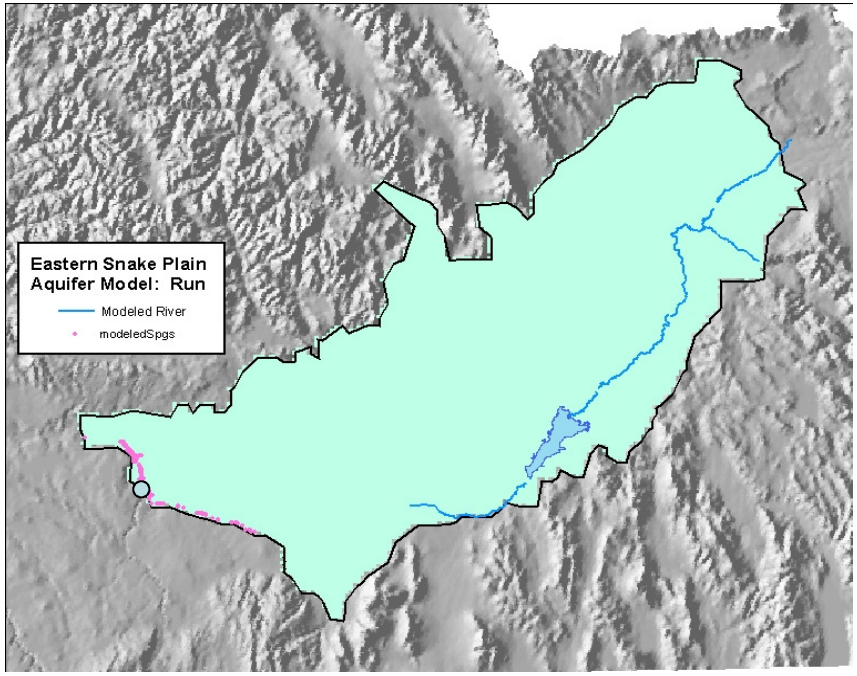


- Briggs Spring

- Briggs Spring

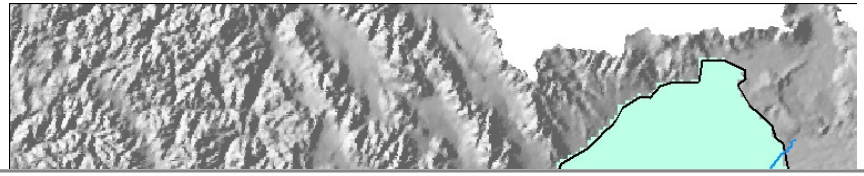


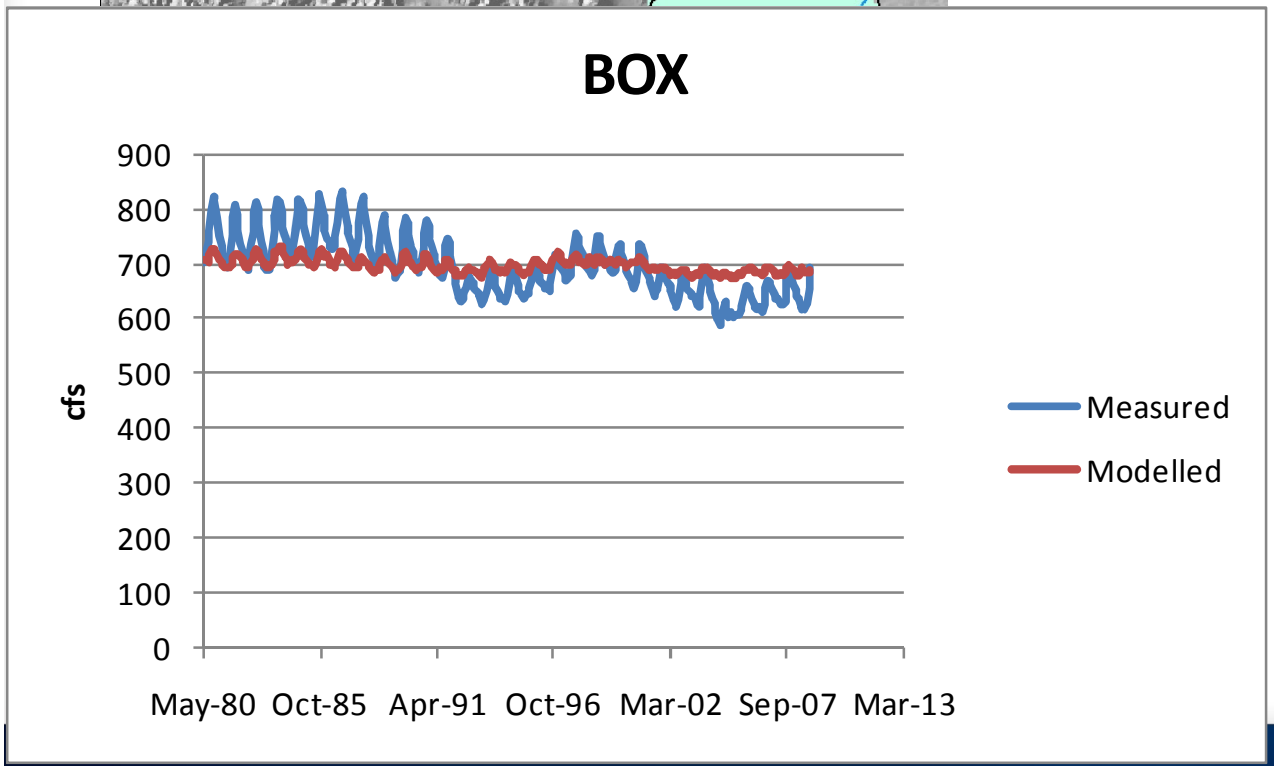


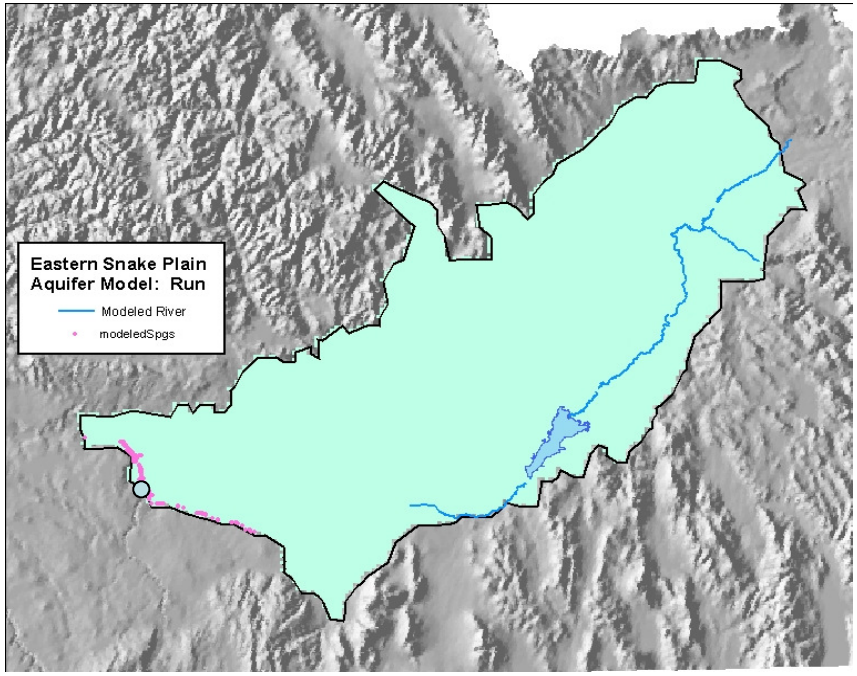


- Box Canyon Spring

- Box Canyon Spring

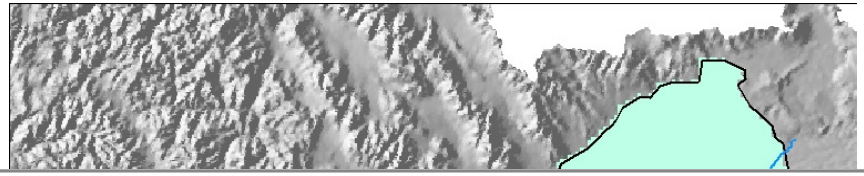


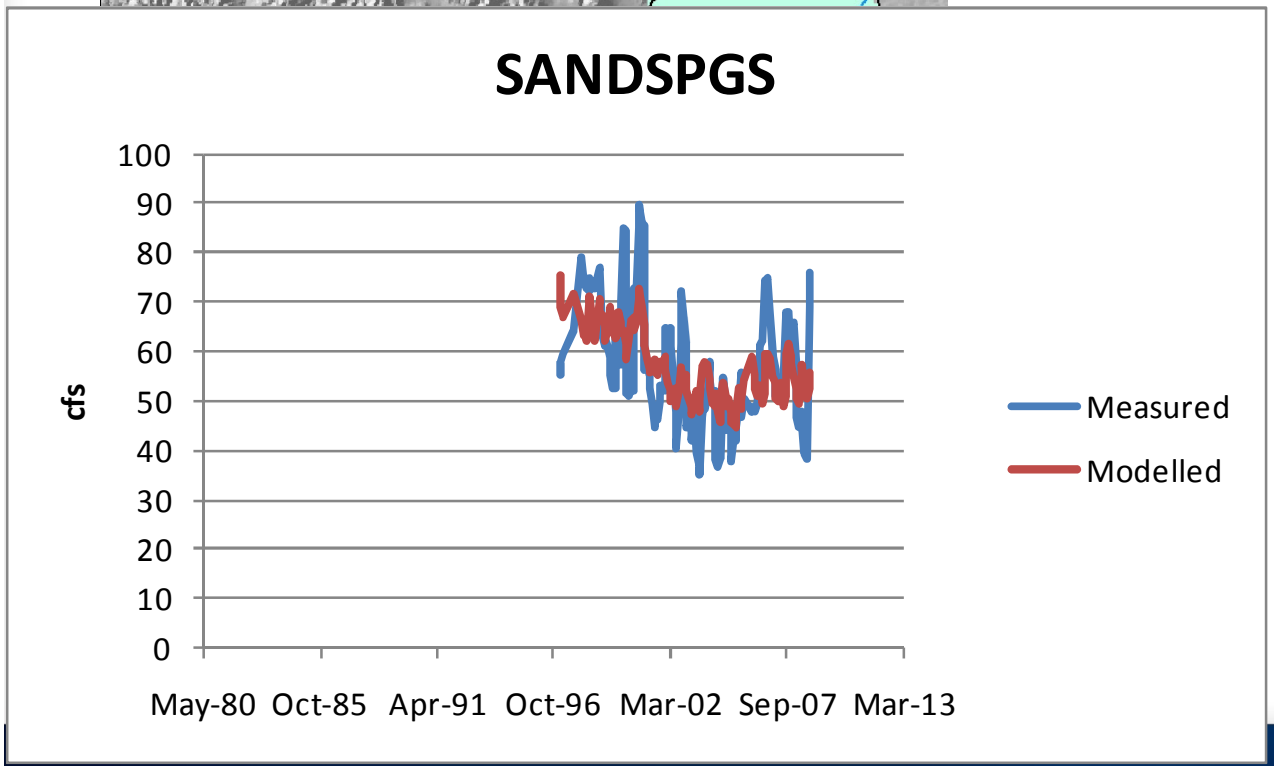


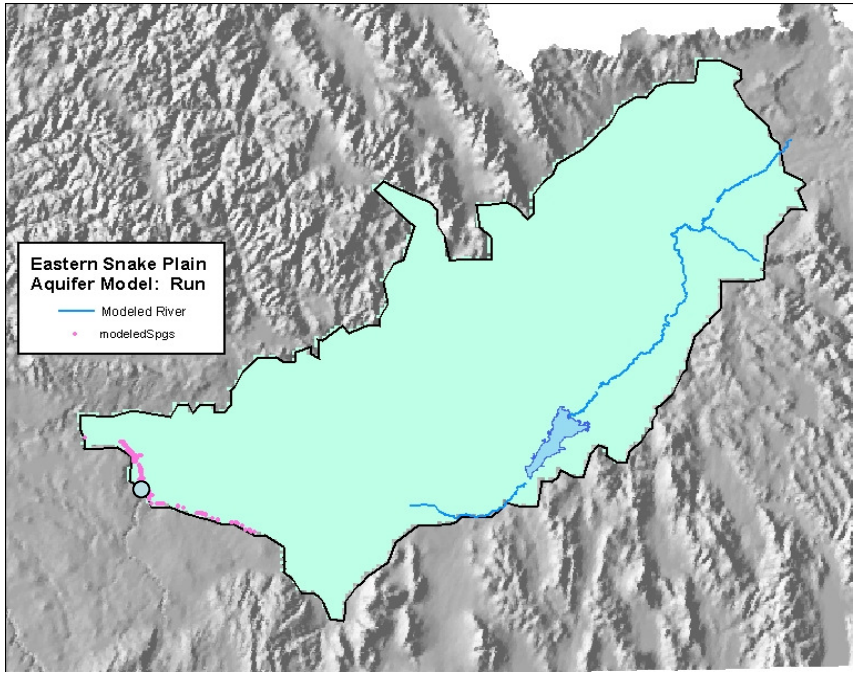


- Sand Springs

- Sand Springs

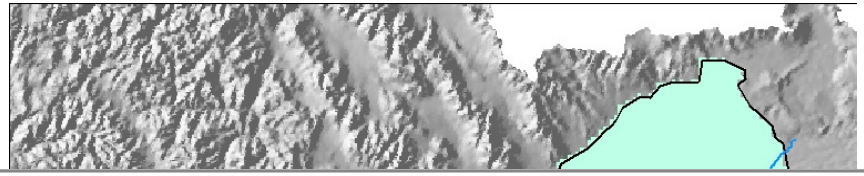


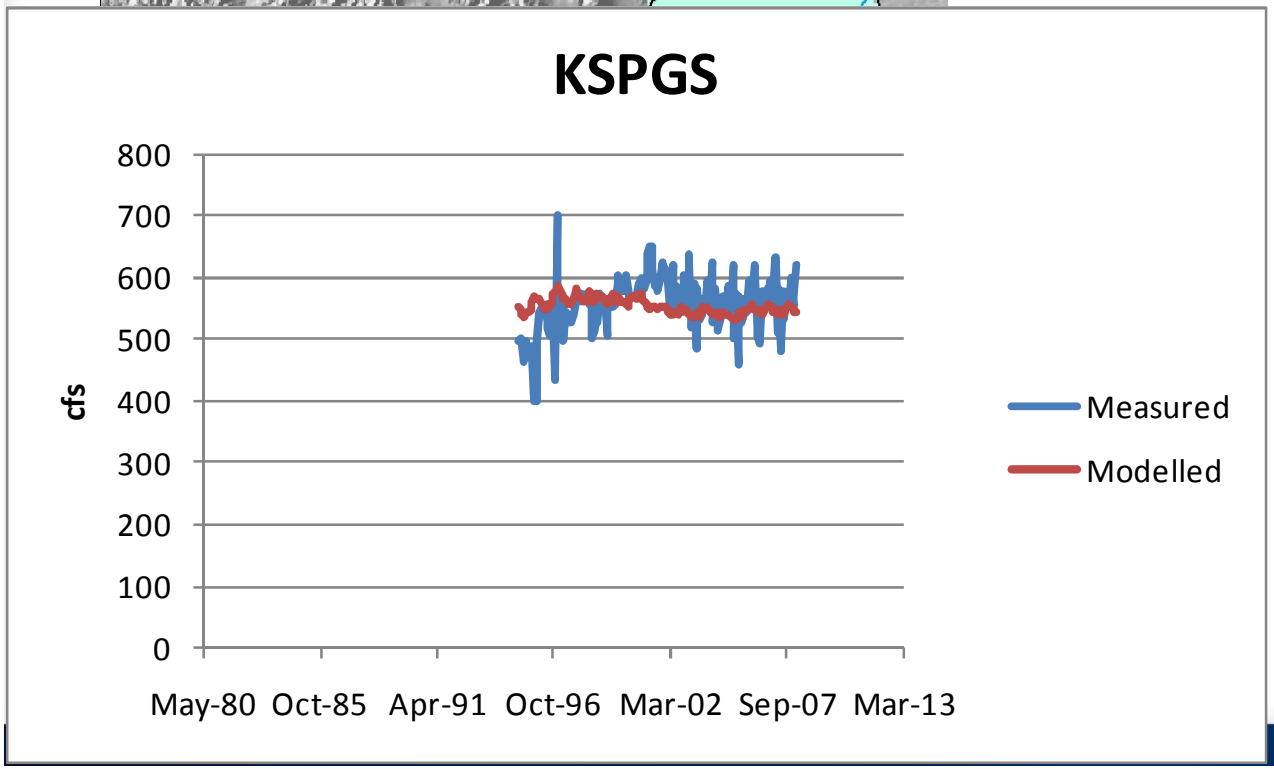


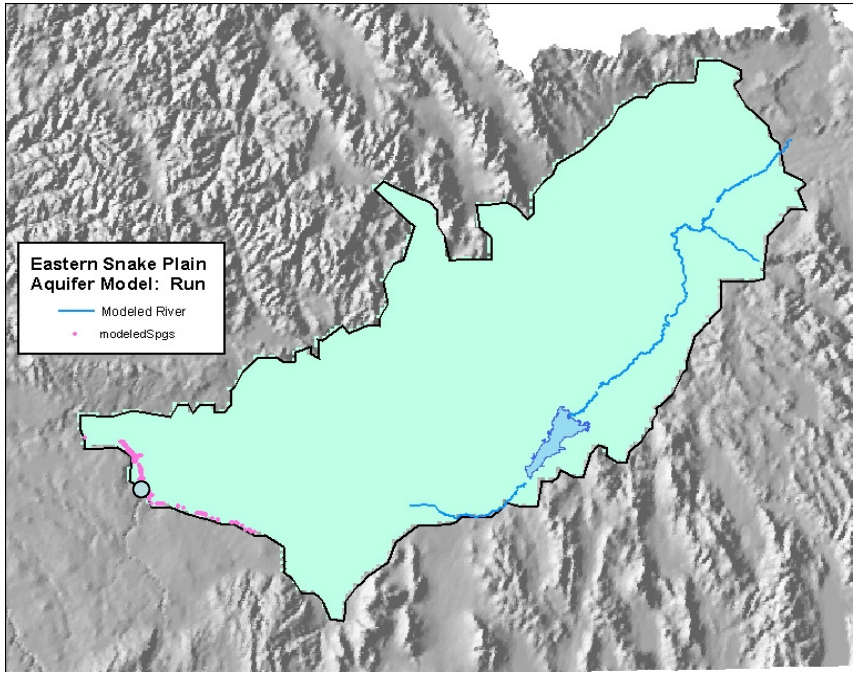


- Thousand Springs

- Thousand Springs

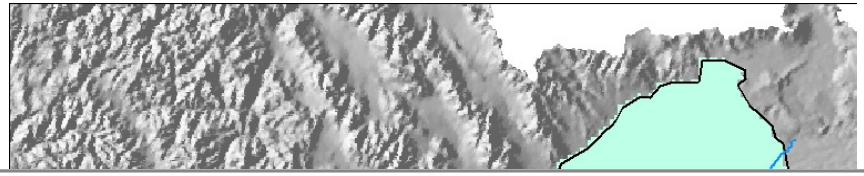


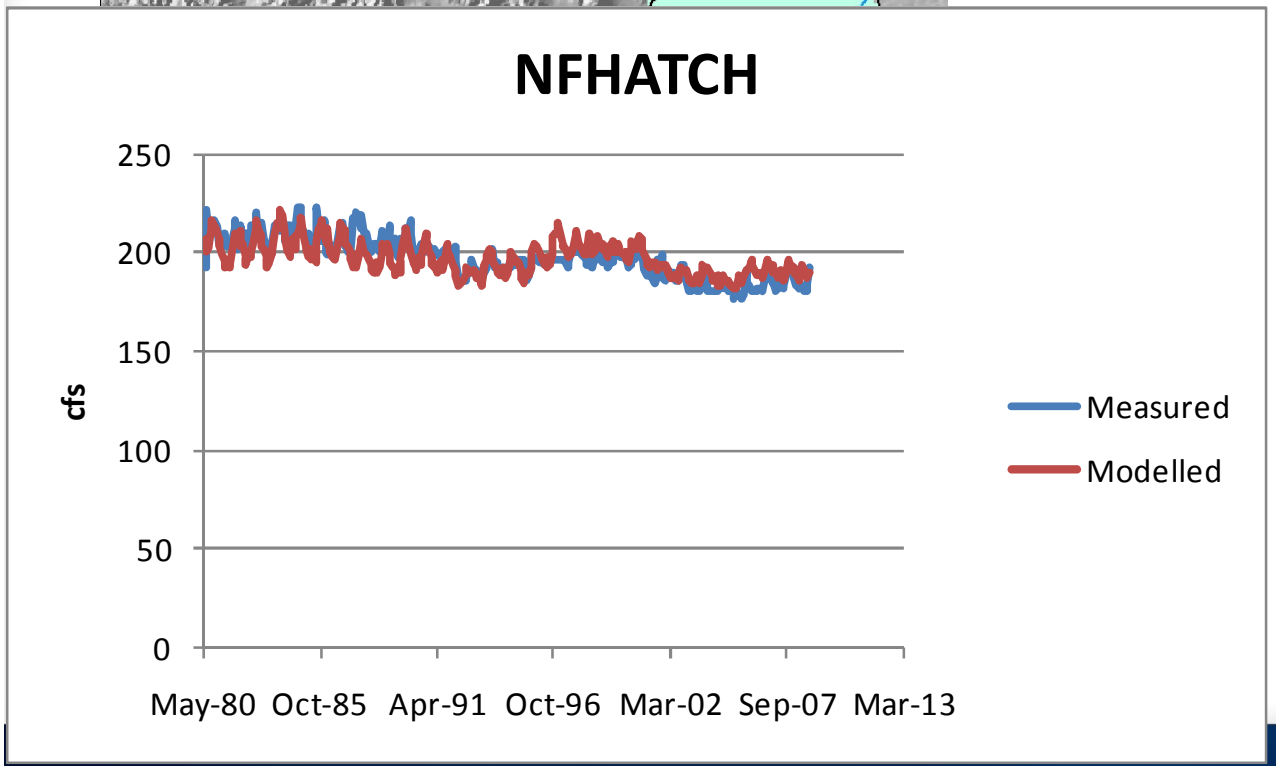


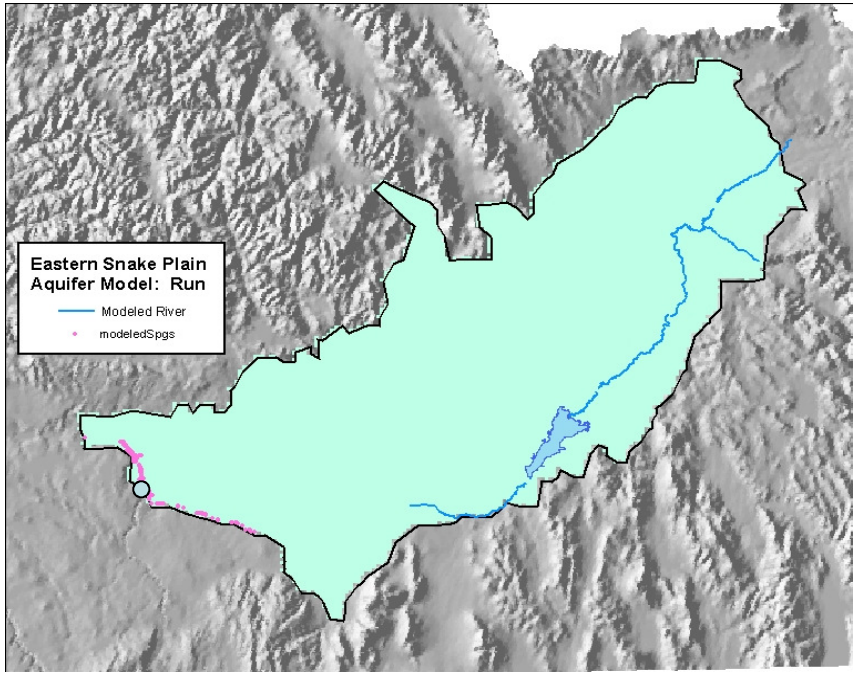


- Ntl Fish Hatchery

- Ntl Fish Hatchery

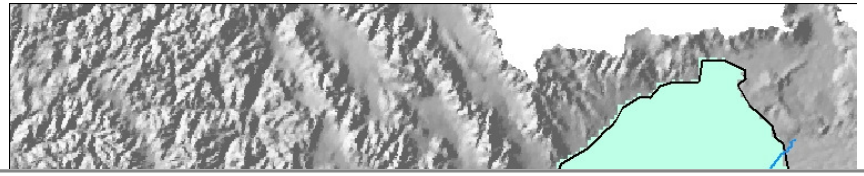


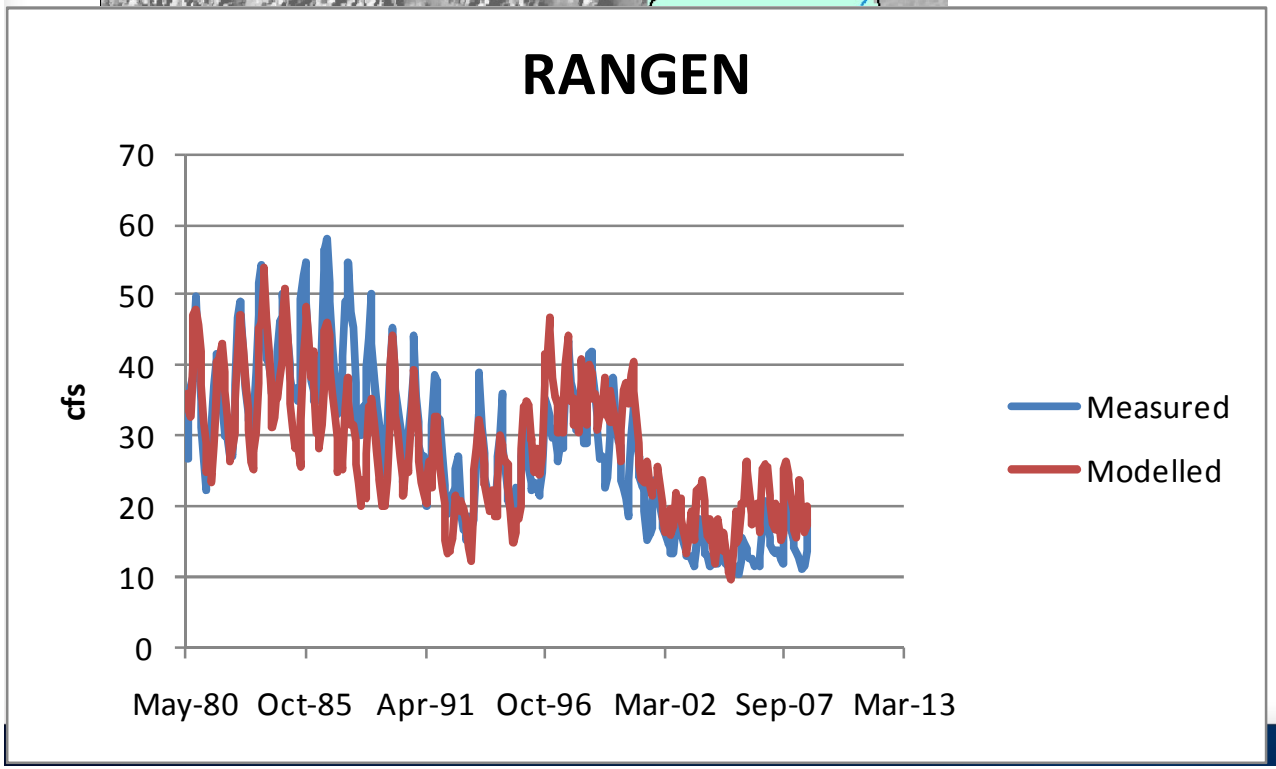


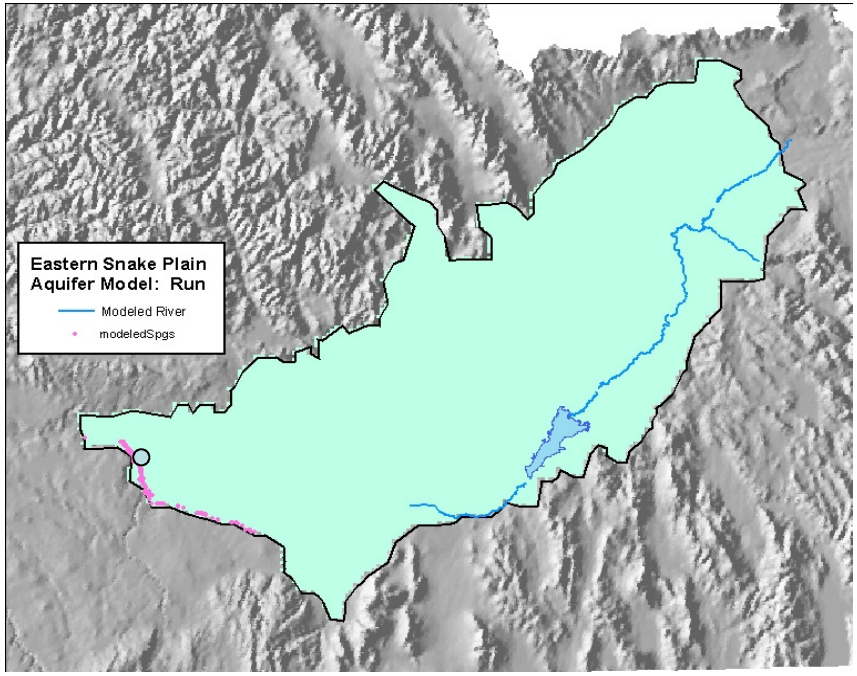


- Rangen Spring

- Rangen Spring

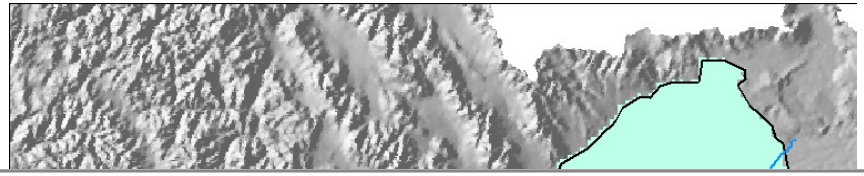


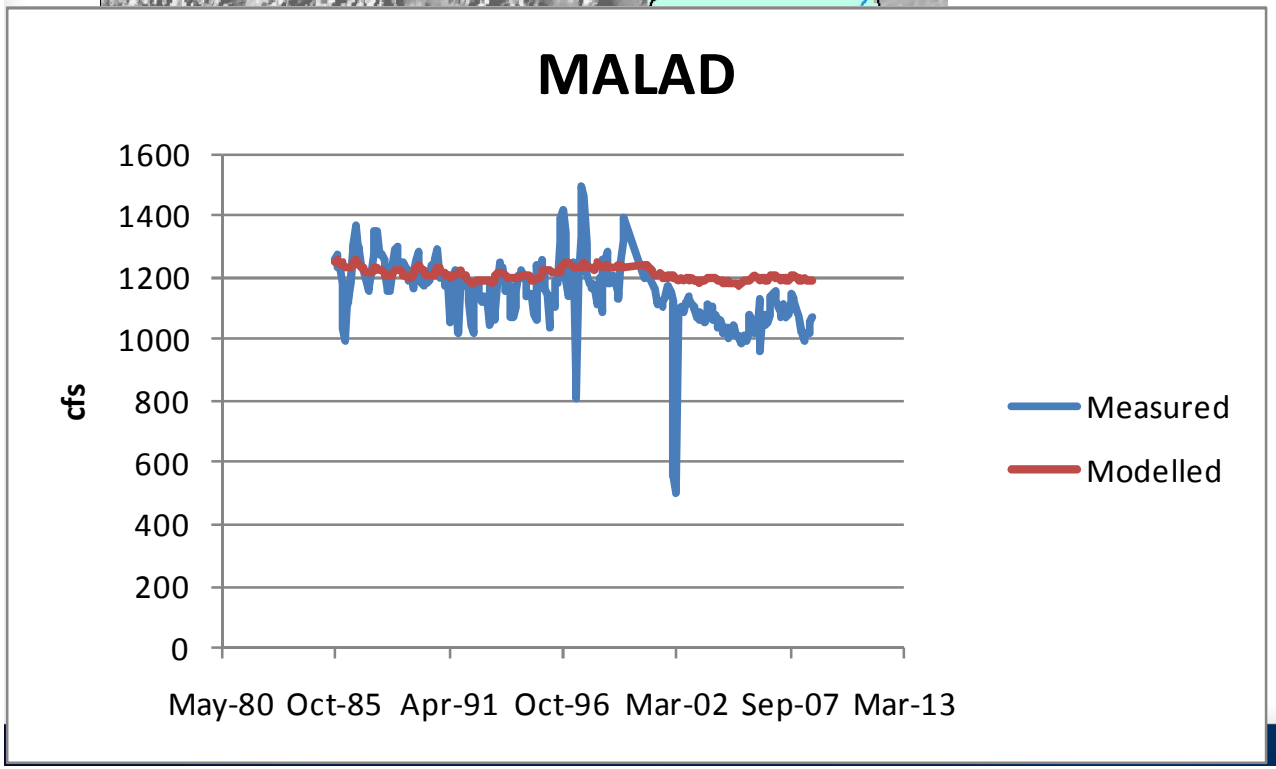


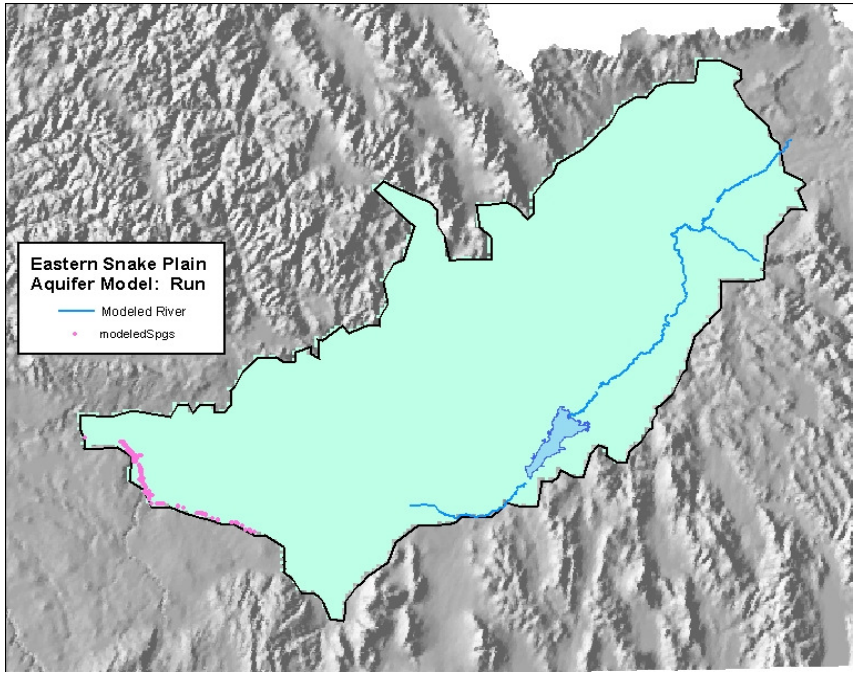

Eastern Snake Plain
Aquifer Model: Run
Modeled River
modeledSpgs

- Malad

- Malad

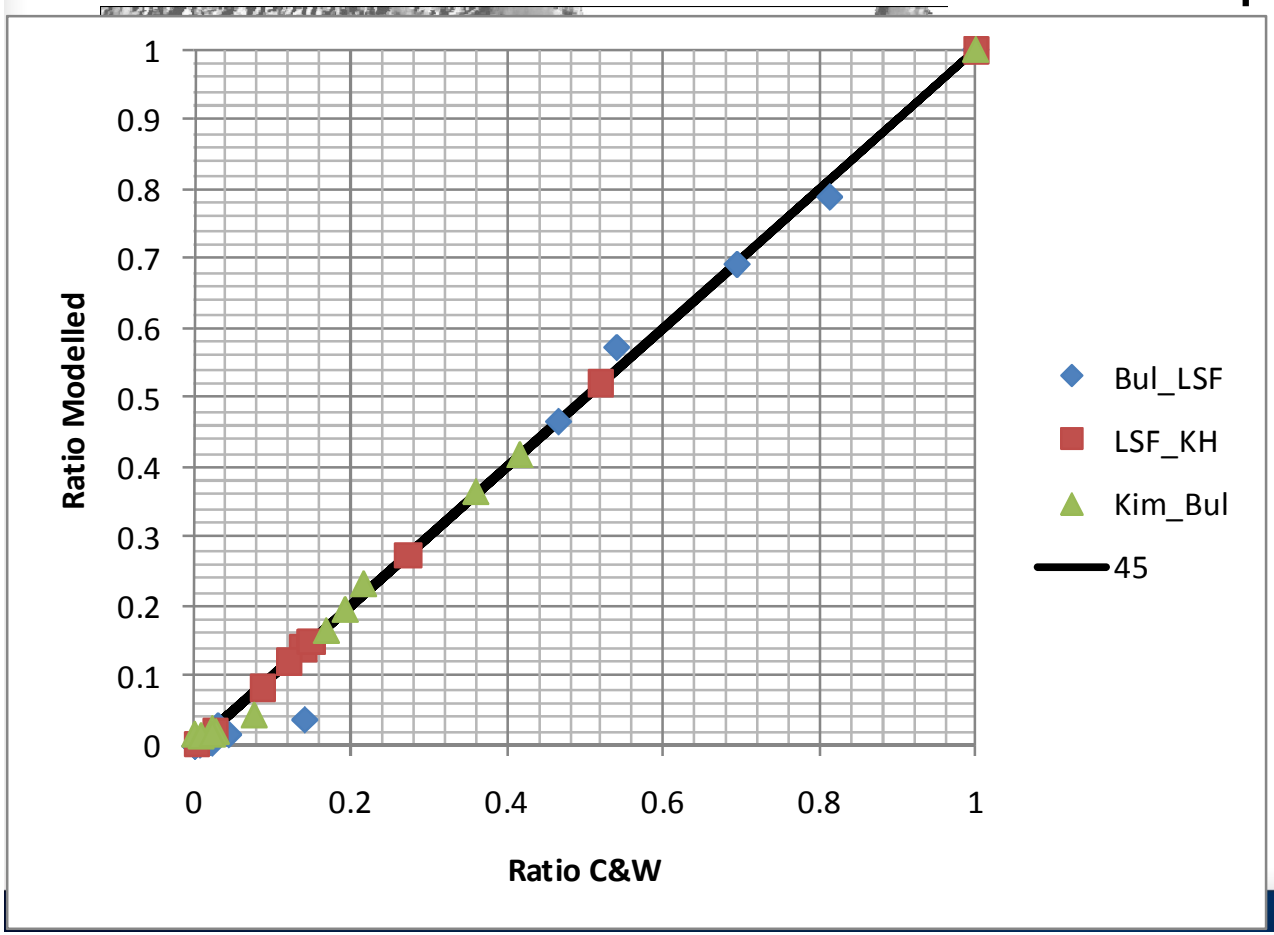


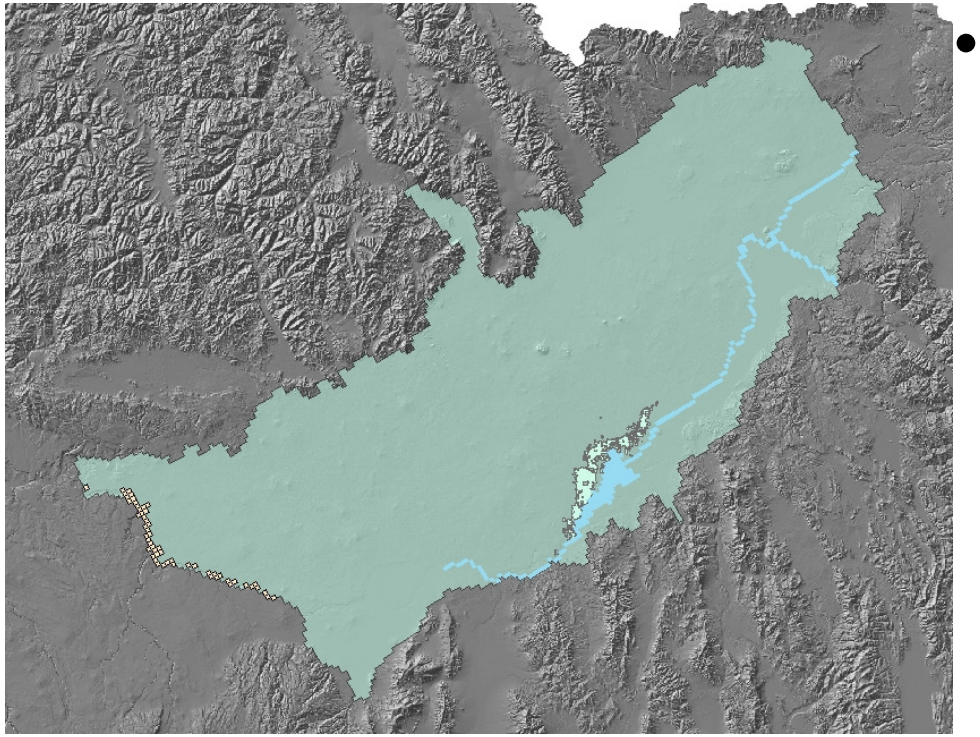

MALAD
1600
1400
1200
1000
800
600
400
200
0
cfs
May-80
Oct-85
Apr-91
Oct-96
Mar-02
Sep-07
Mar-13
Measured
Modelled



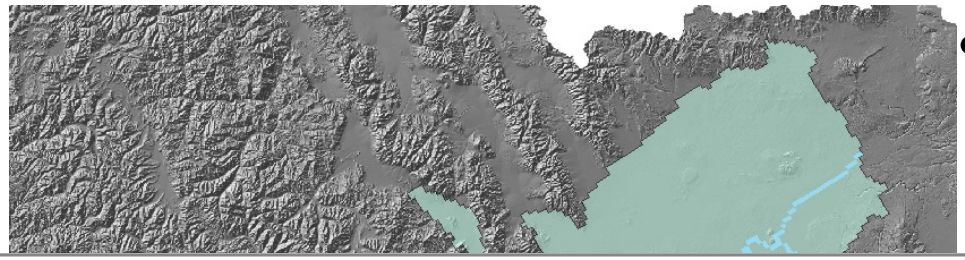
- Group C Springs

- Group C Springs

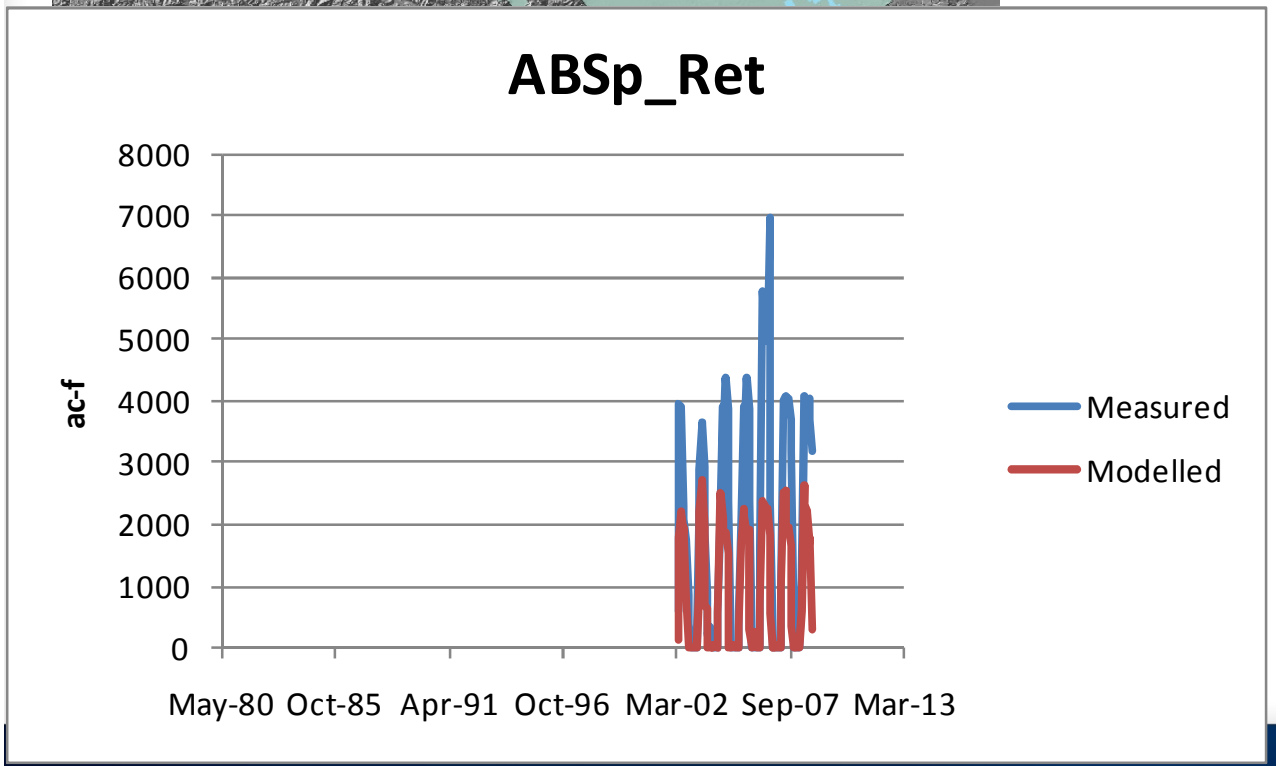


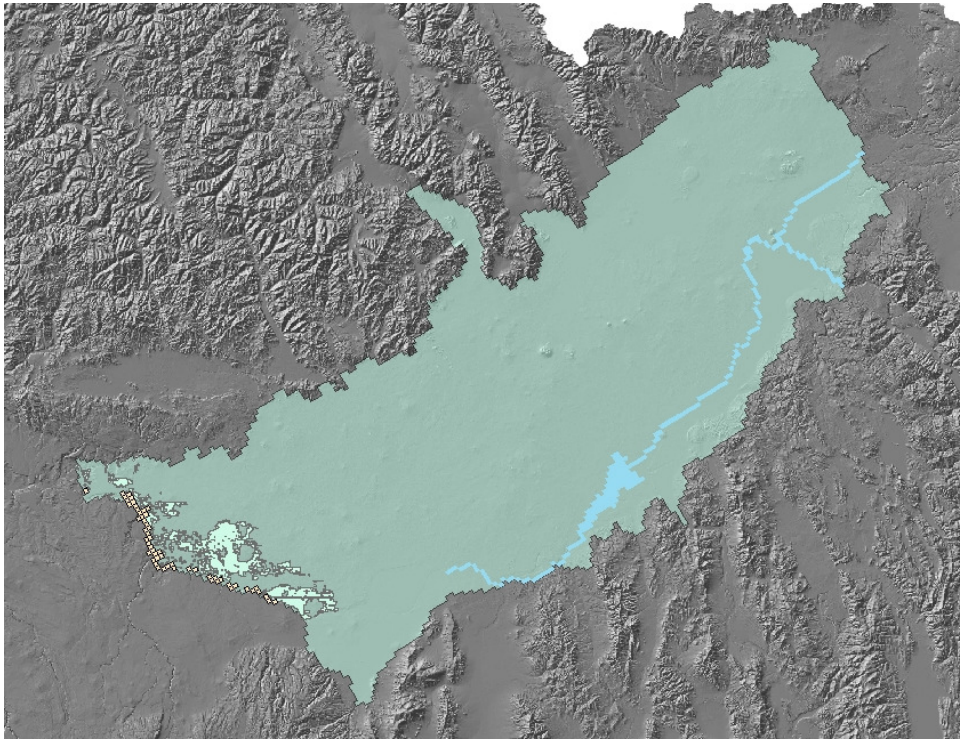


- Aberdeen-Springfield returns

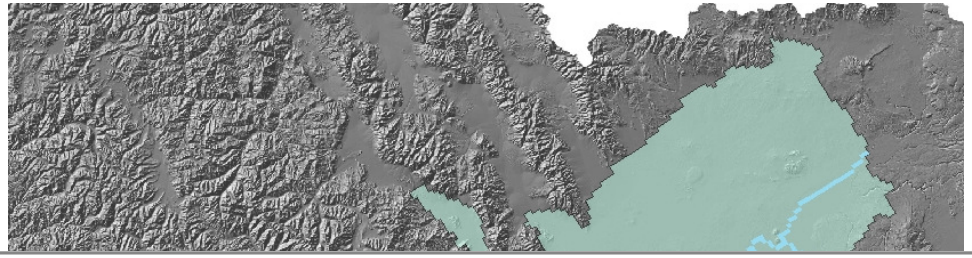


- Aberdeen-Springfield returns

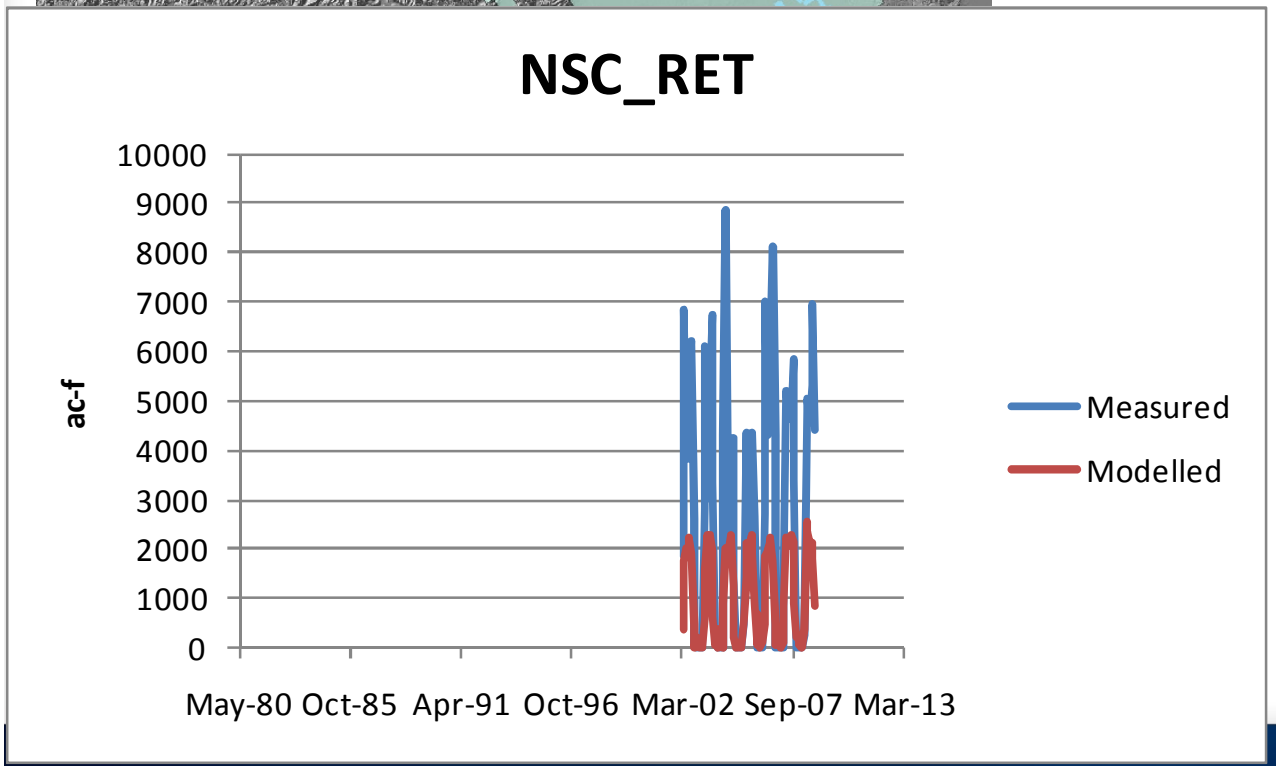




- North Side Canal Co returns



- North Side Canal Co returns



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