Calibration with A,B, & C Springs using E110406A with Return Flow Targets

Allan Wylie IDWR

Reach Gain and Spring Discharge Targets

- Monthly Stress Periods
  - Using
    - MKMOD6.exe
      - Using On-Farm algorithm
    - E110406A
      - Minidoka and Montview fixed, Mud Lake adjustments
    - 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

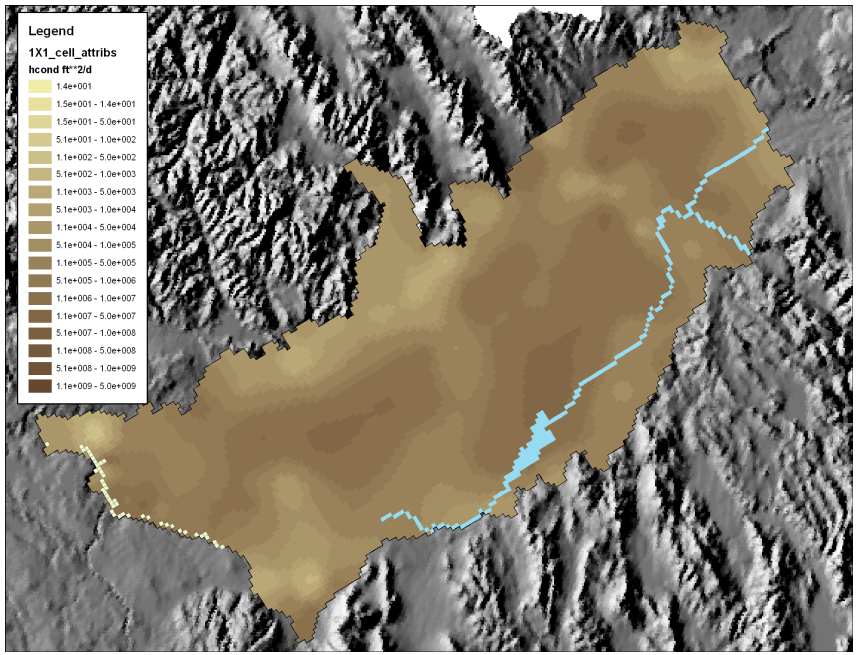
Reach Gain and Spring Discharge Targets

- 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 2 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
    - 2 – 0.5
    - Split Cam/Bev and Hnry Fork
      - 8 – 1e-6

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 DPin and DPex fixed at 1.0

V 1.1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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
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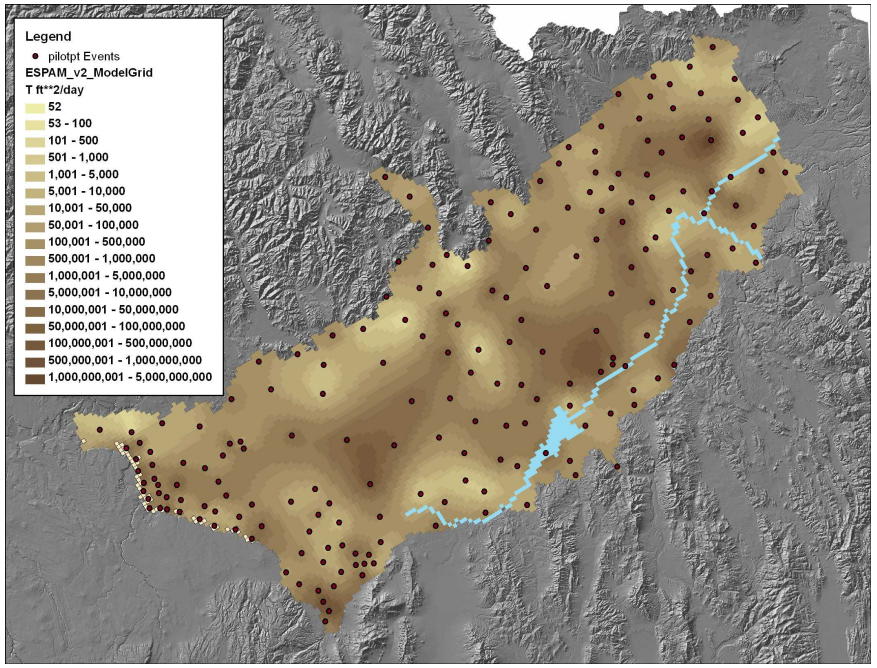
5.1e+008 - 1.0e+009
1.1e+009 - 5.0e+009


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
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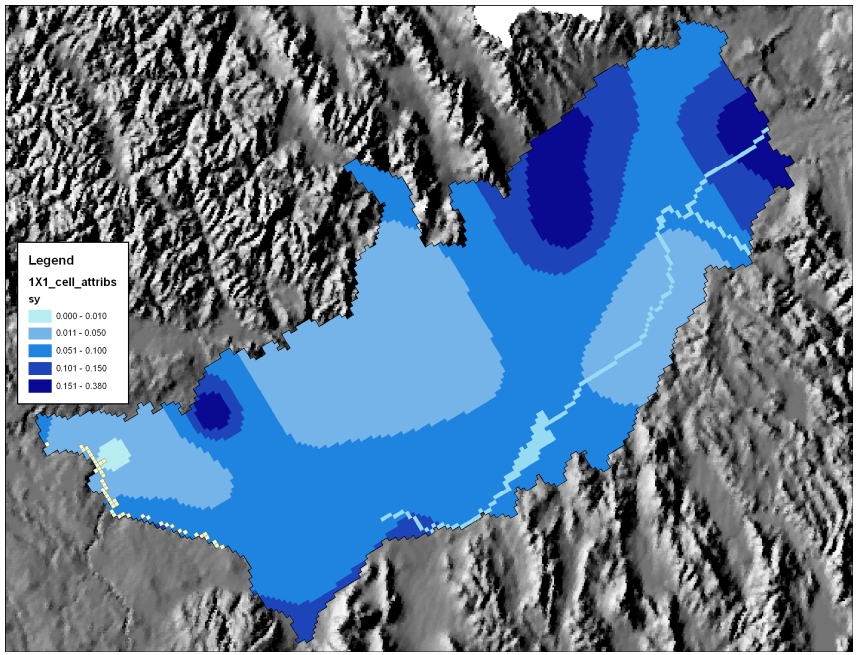
500,000,001 - 1,000,000,000
1,000,000,001 - 5,000,000,000

V 1.1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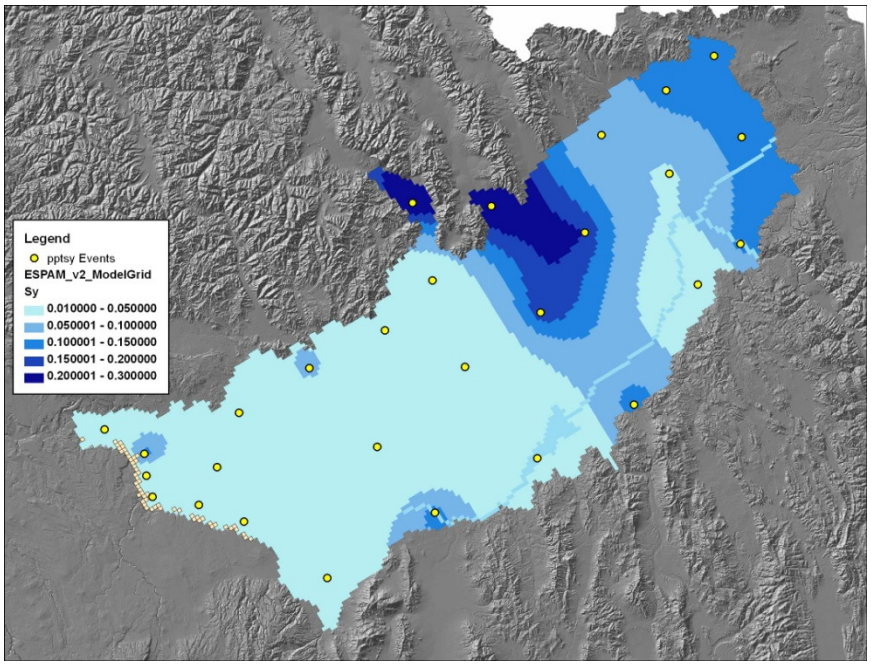
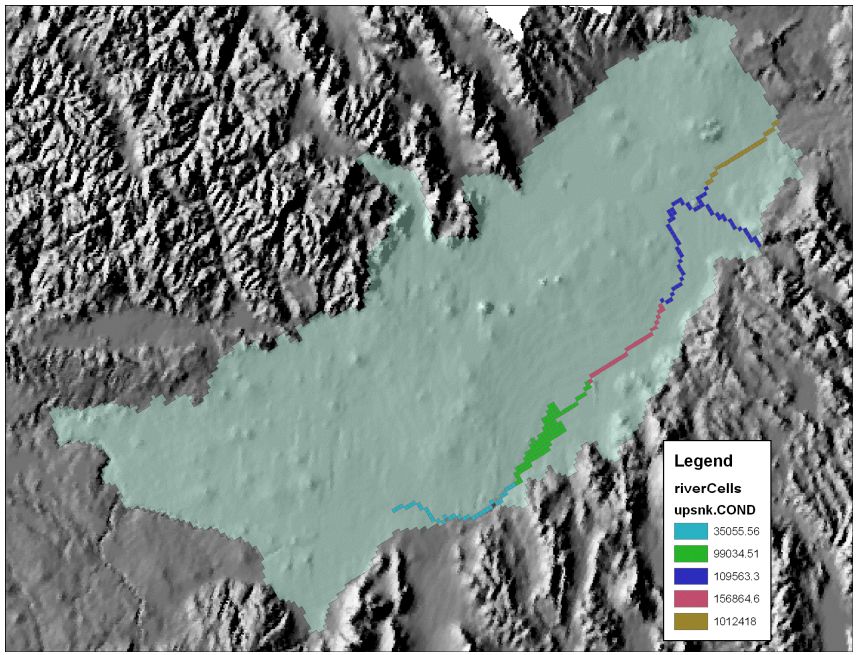
1X1_cell_attribs
sy
0.000 - 0.010
0.011 - 0.050
0.051 - 0.100
0.101 - 0.150
0.151 - 0.380


Legend
pptsy Events
ESPAM_v2_ModelGrid
Sy
0.010000 - 0.050000
0.050001 - 0.100000
0.100001 - 0.150000
0.150001 - 0.200000
0.200001 - 0.300000

V 1.1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upsnk.COND
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99034.51
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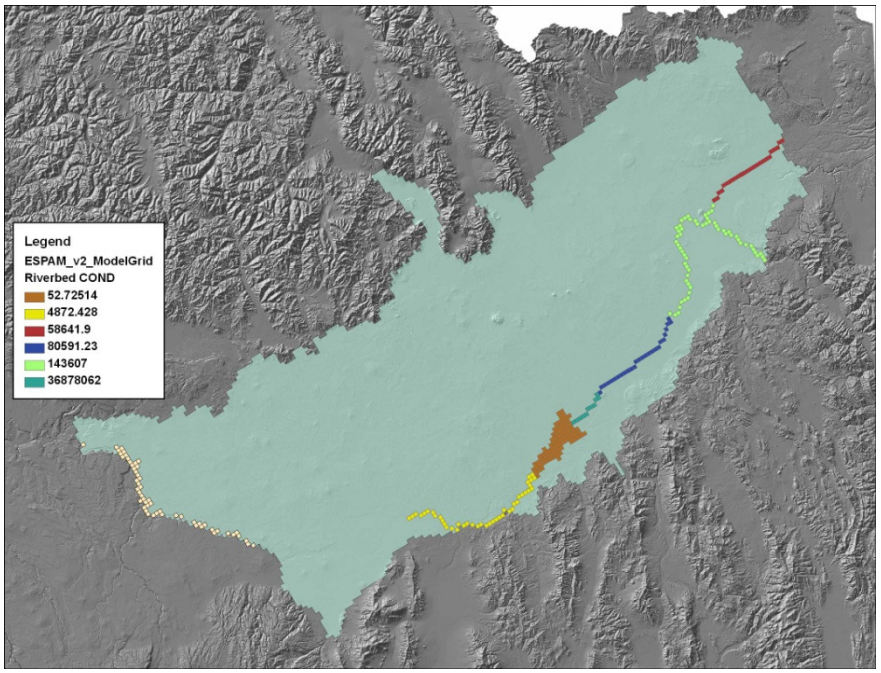
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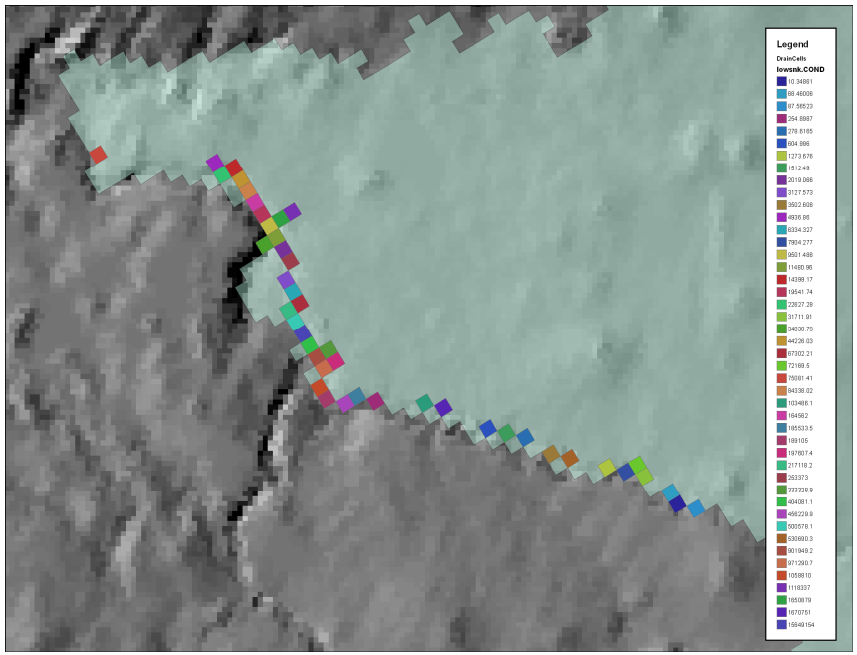
V 1.1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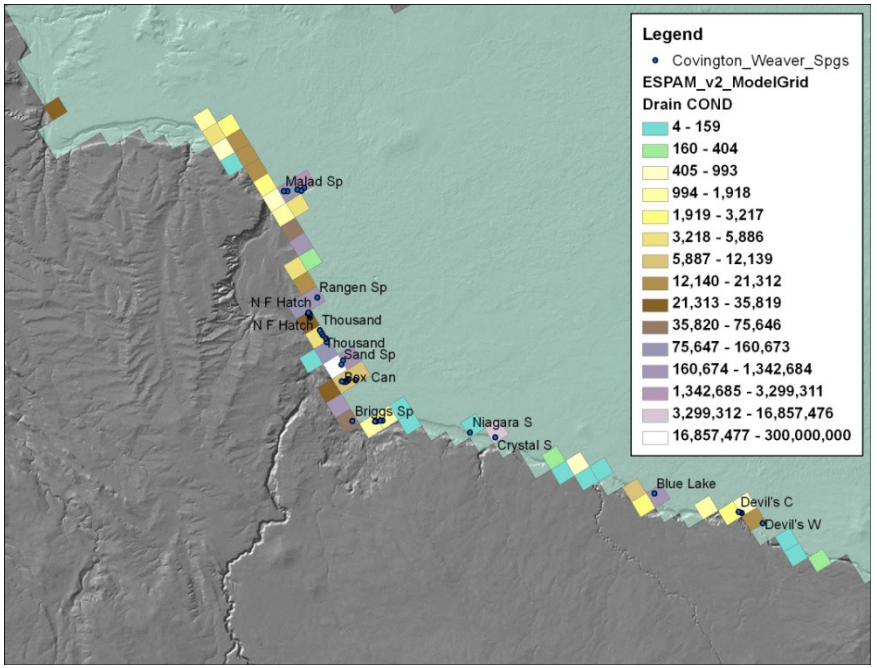
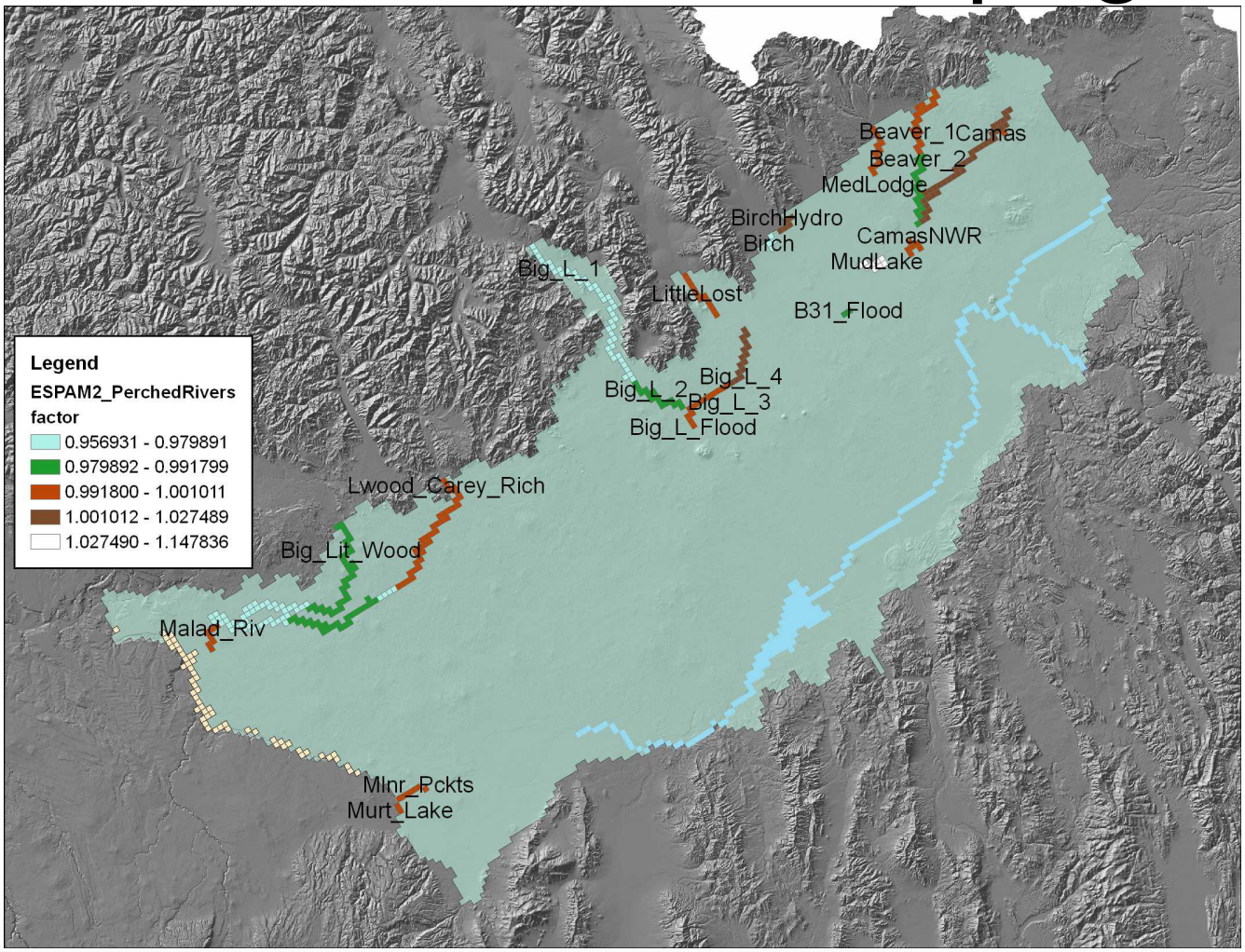
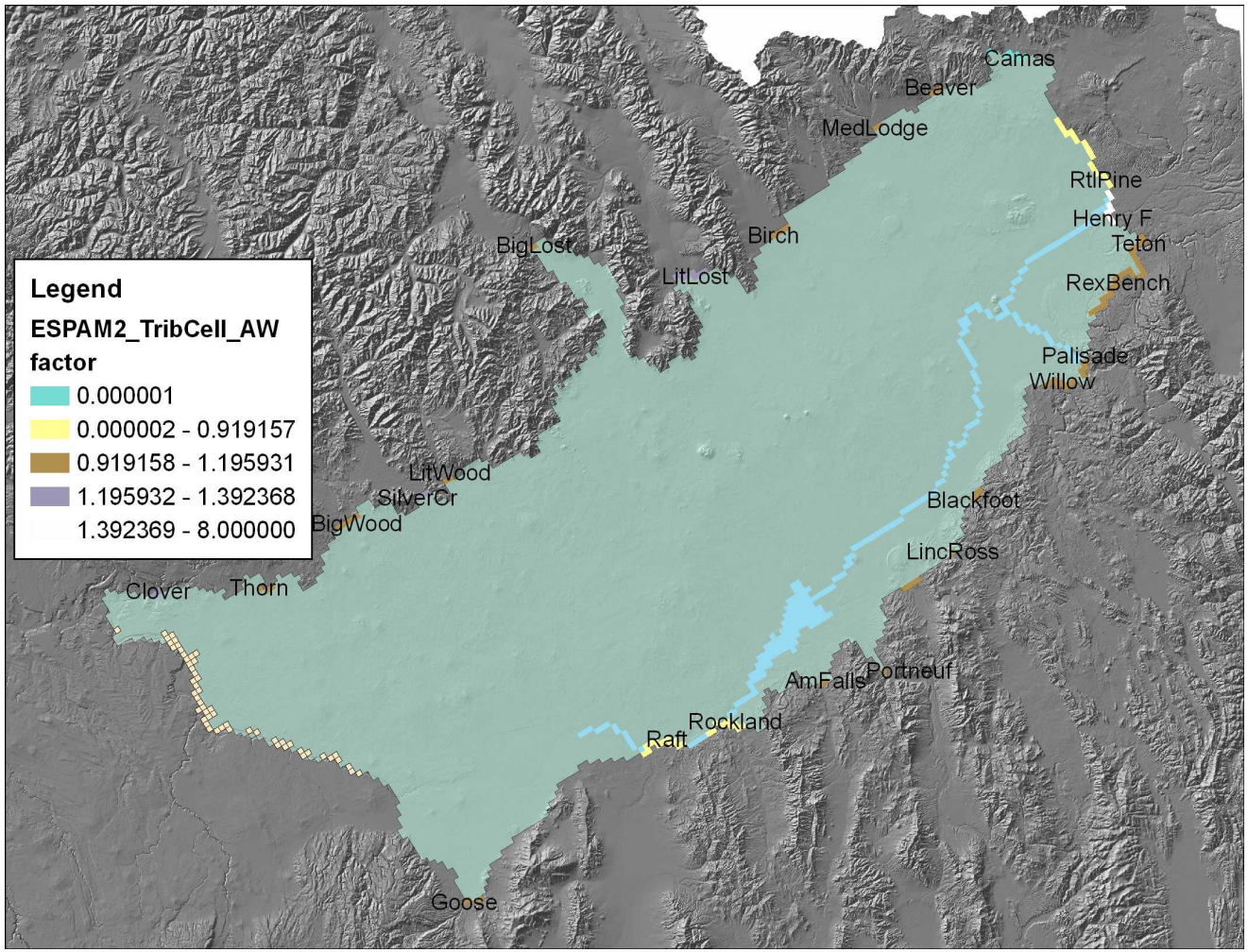
DrainCells
lowsnk.COND


Legend
Covington_Weaver_Spgs
ESPAM_v2_ModelGrid
Drain COND
4 - 159
160 - 404
405 - 993
994 - 1,918
1,919 - 3,217
3,218 - 5,886
5,887 - 12,139
12,140 - 21,312
21,313 - 35,819
35,820 - 75,646
75,647 - 160,673
160,674 - 1,342,684
1,342,685 - 3,299,311
3,299,312 - 16,857,476
16,857,477 - 300,000,000
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

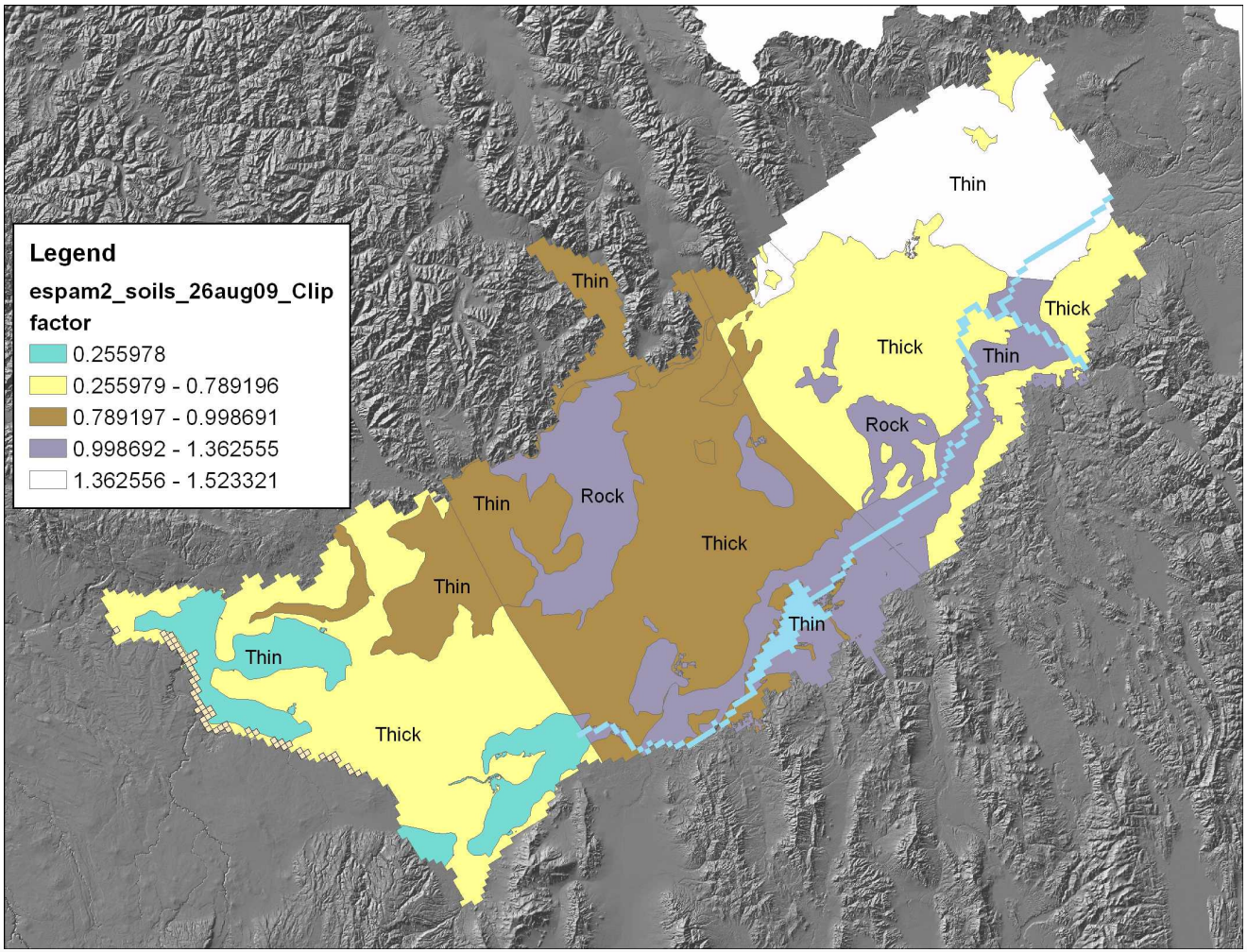
Perched River Seepage



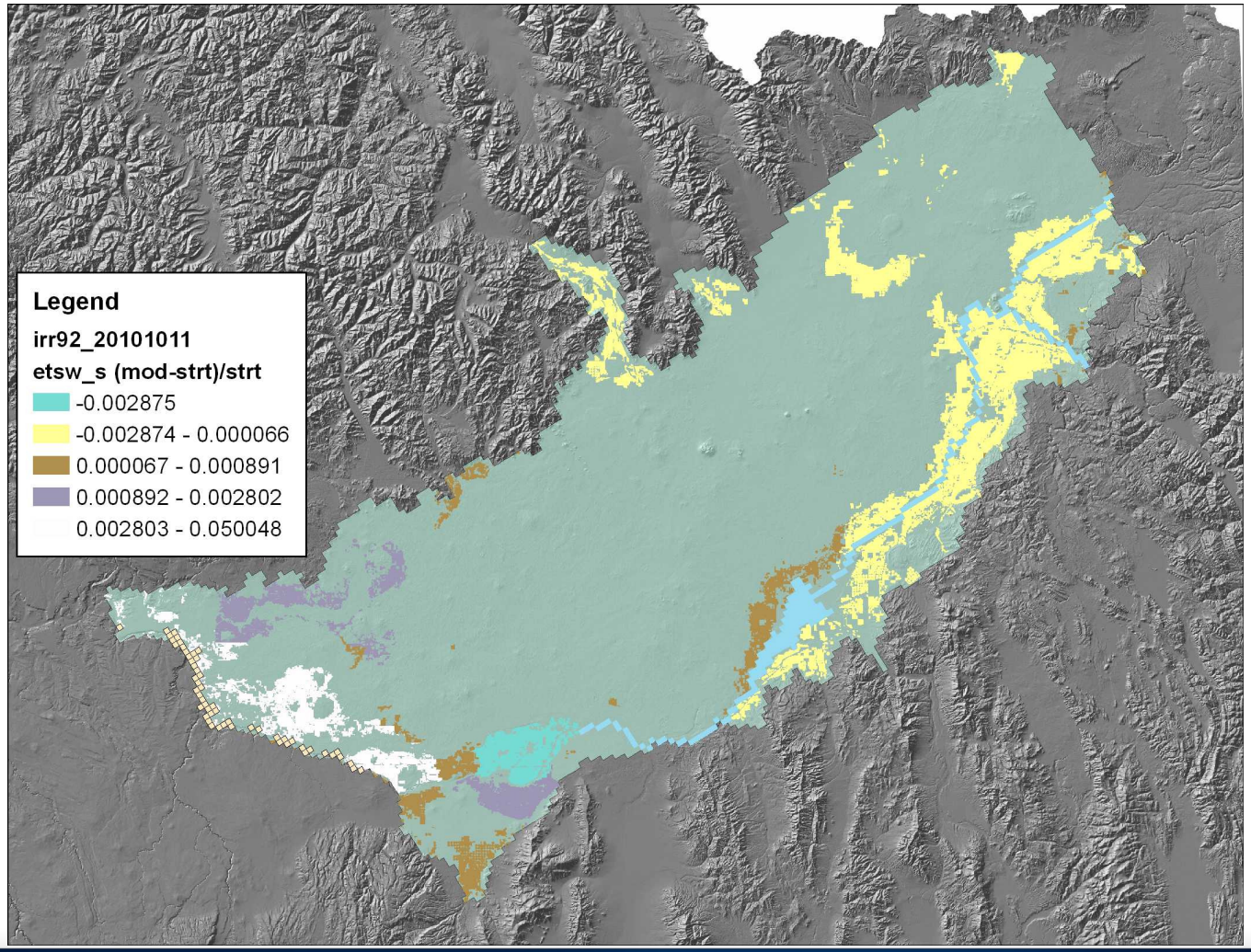
Tributary Underflow



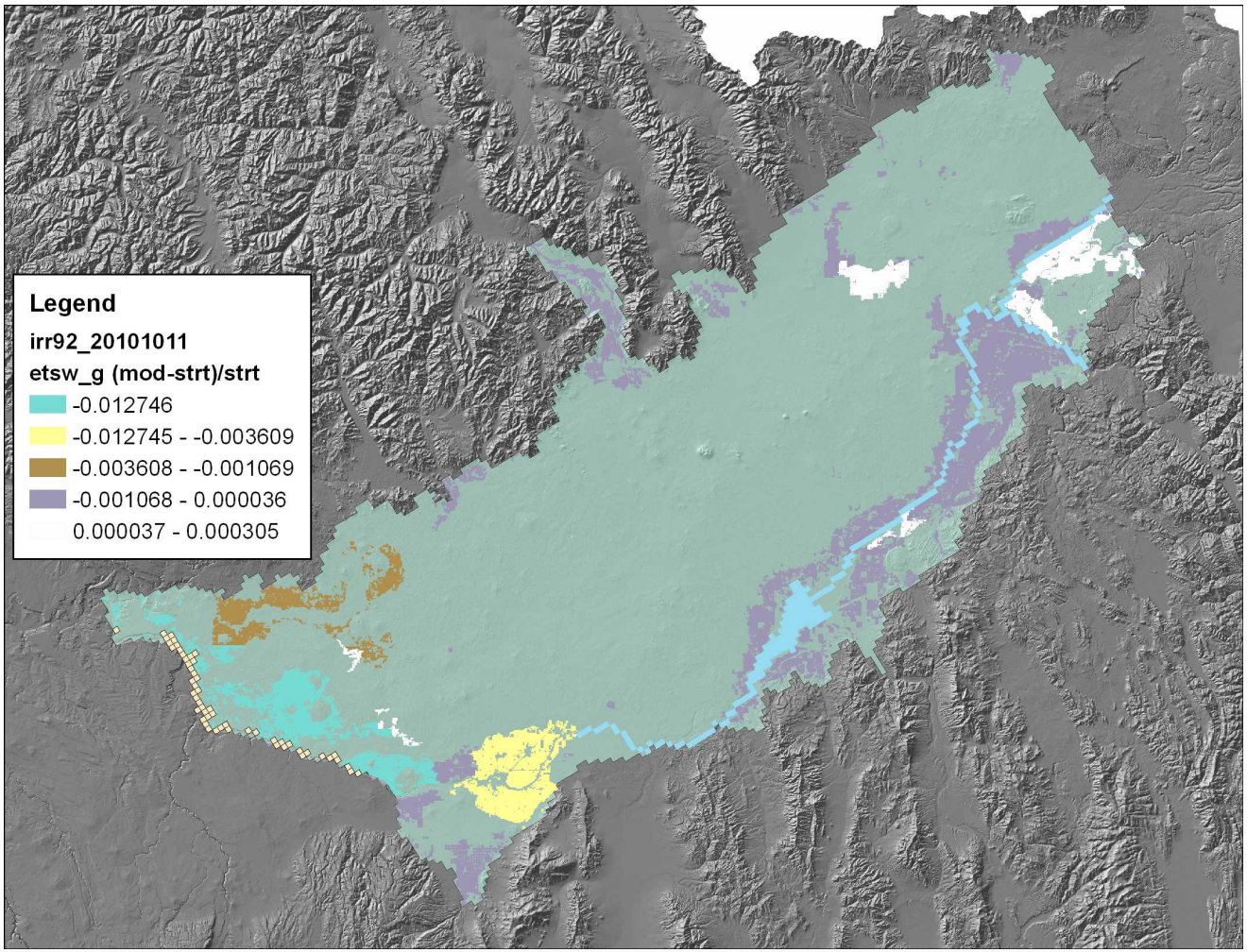
Non-irrigated Recharge



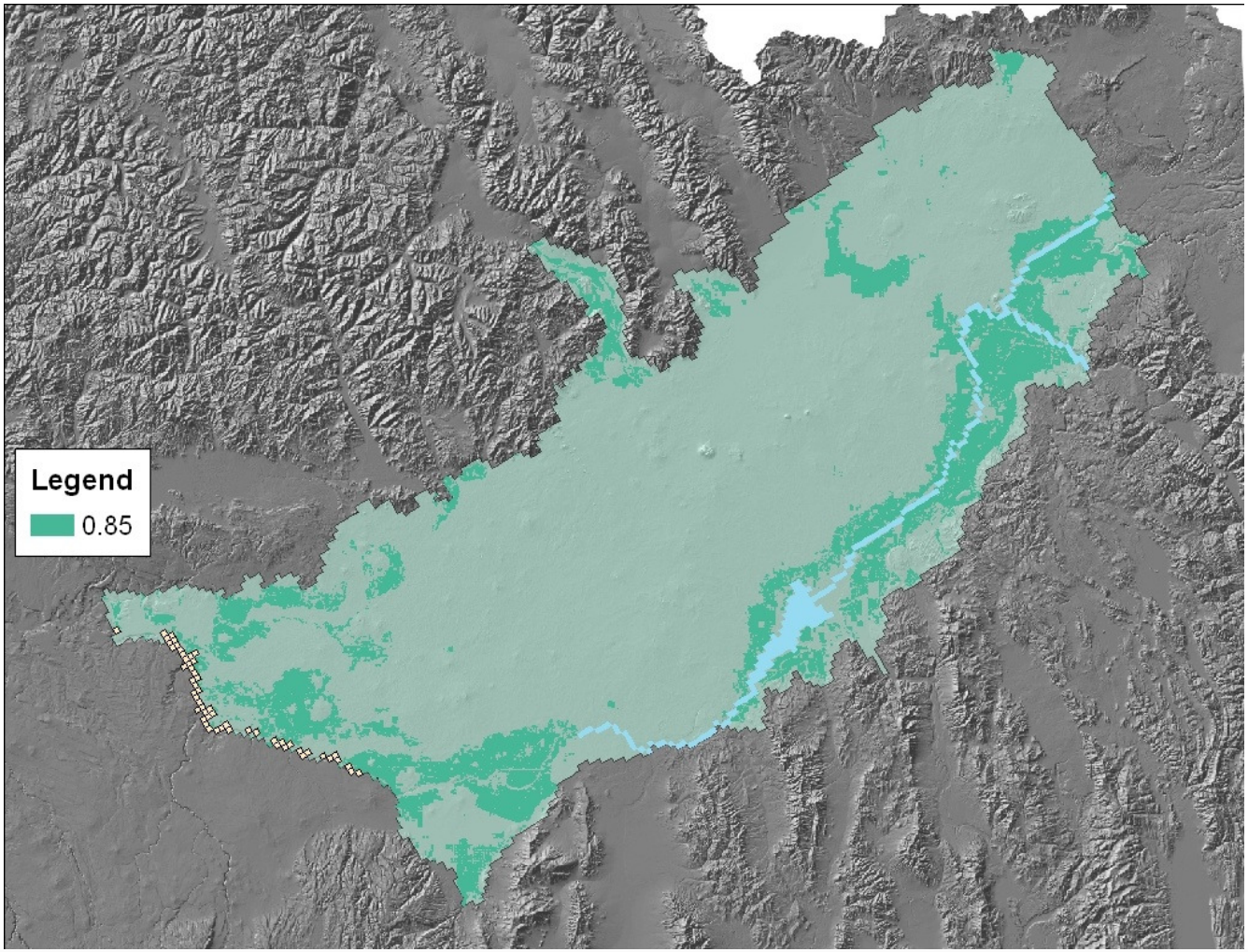
ET Surface Water Sprinkler



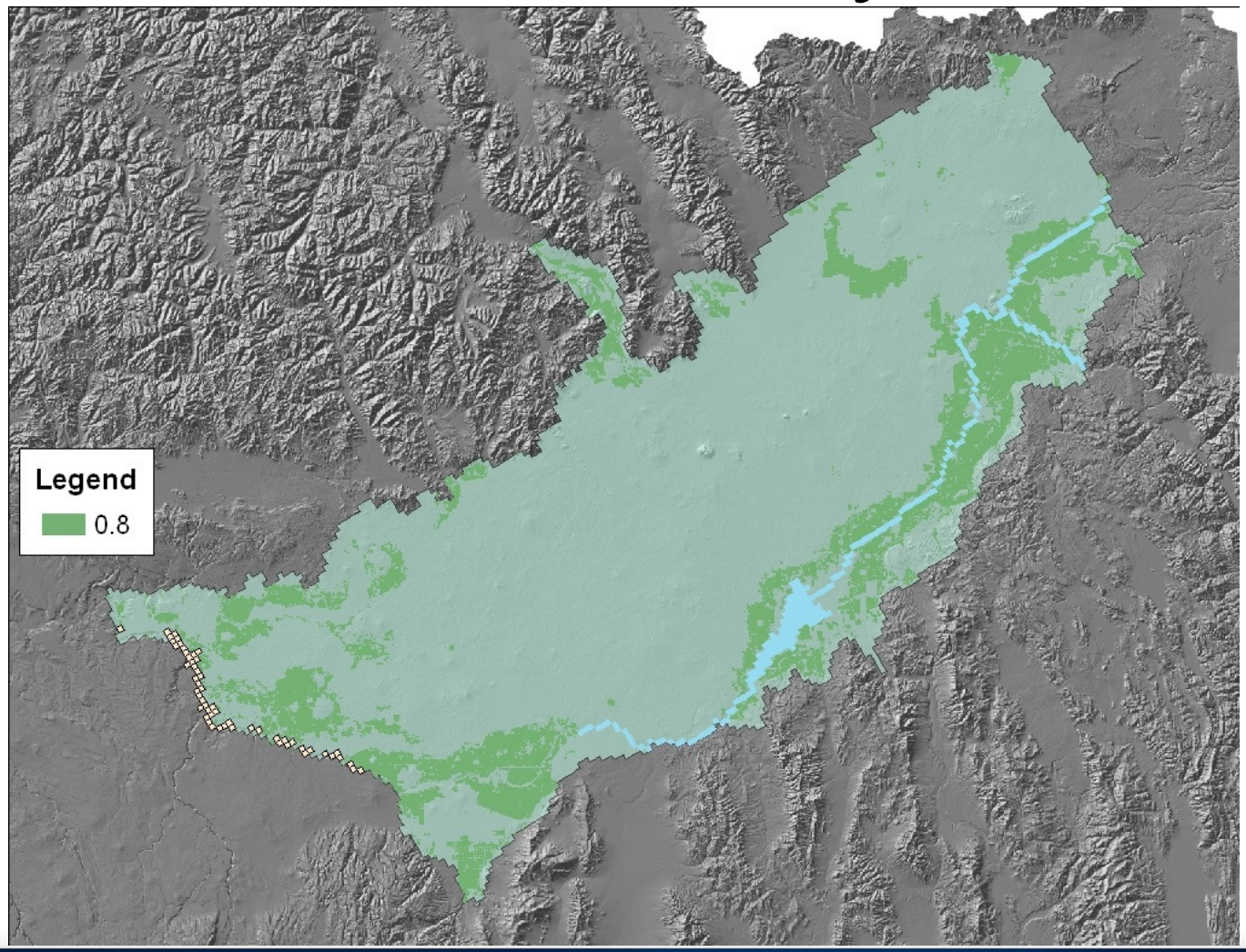
ET Surface Water Gravity

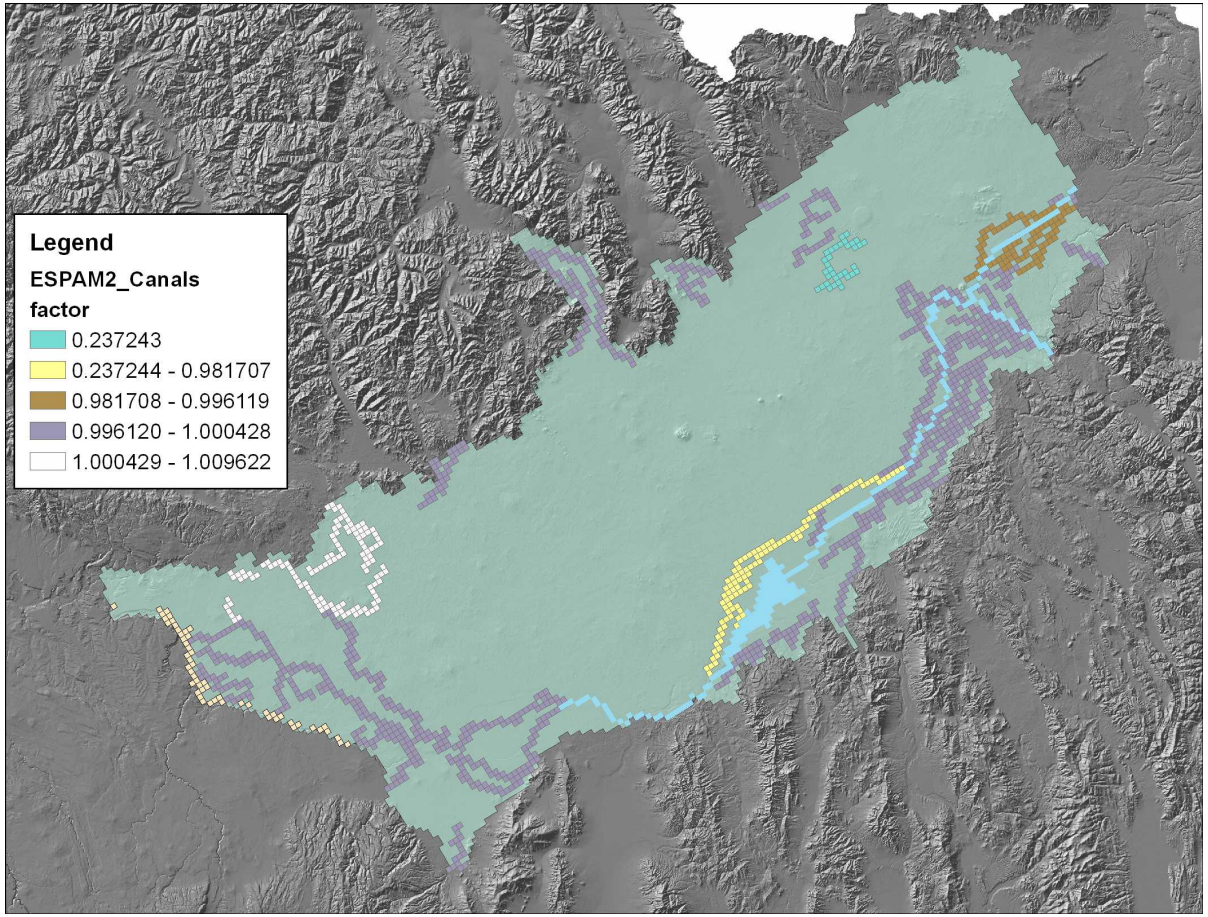


Surface Water Sprinkler Efficiency

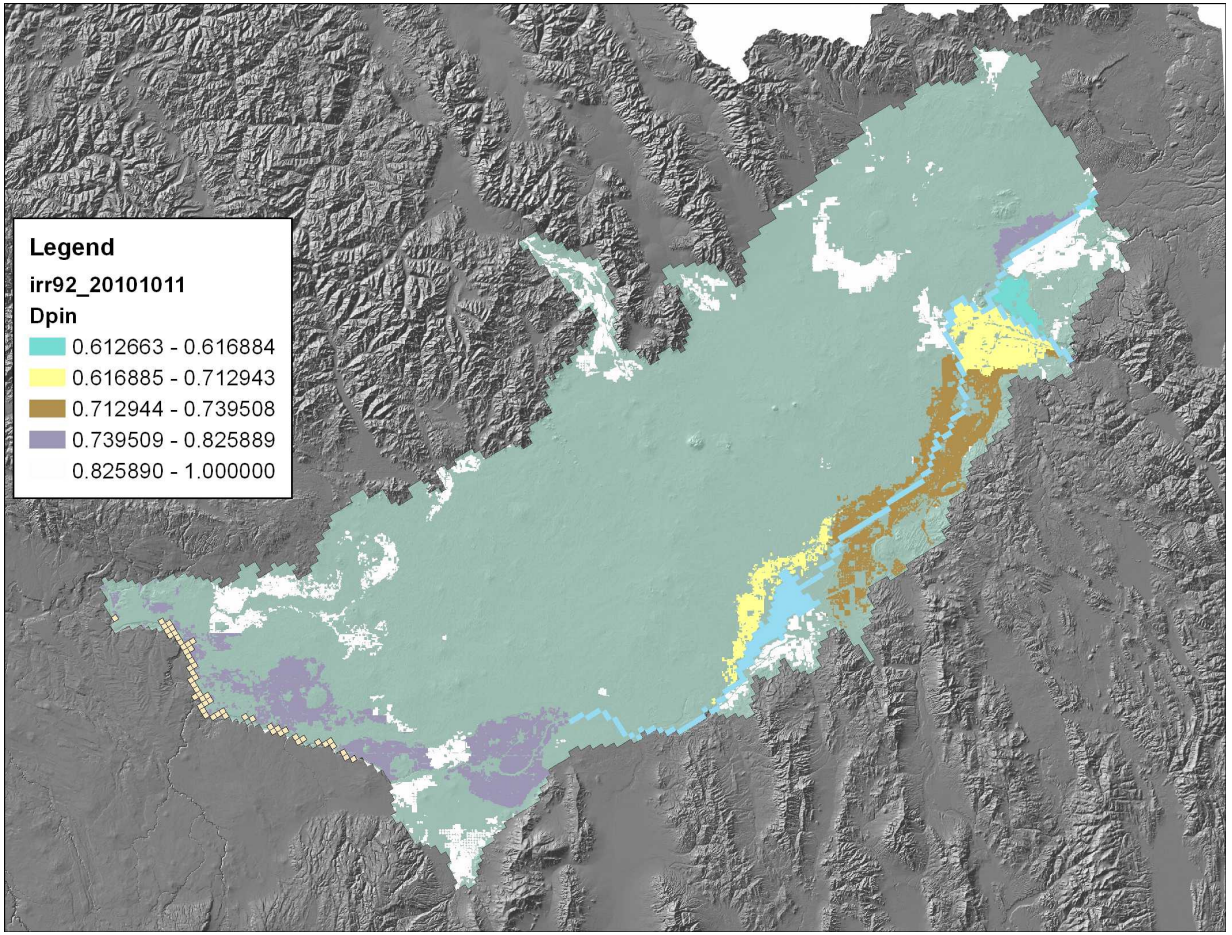


Surface Water Gravity Efficiency

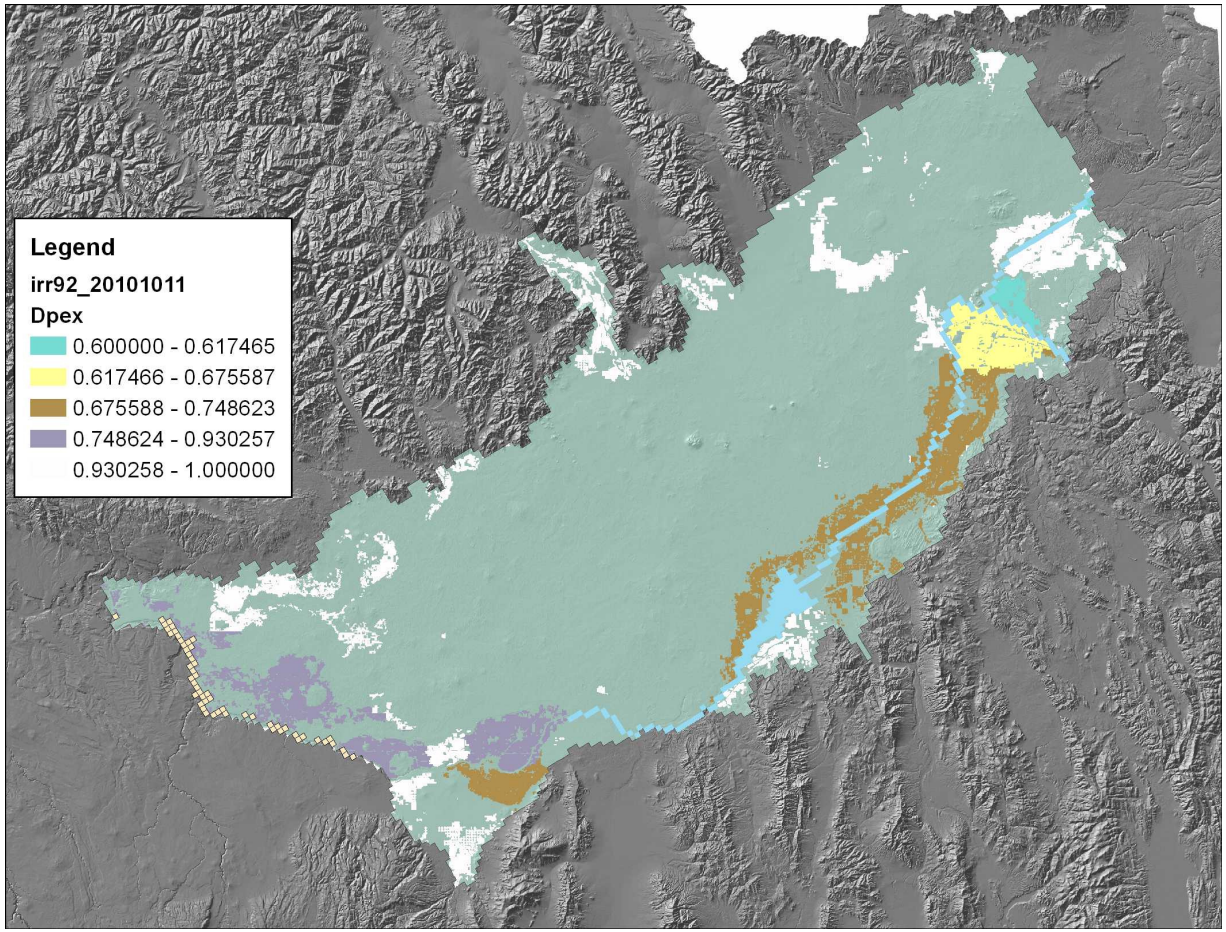




- Canal Seepage
  - CNL fraction * .DIV diversions
  - PEST only allowed to adjust non-coalition entities +/- 5%



- 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

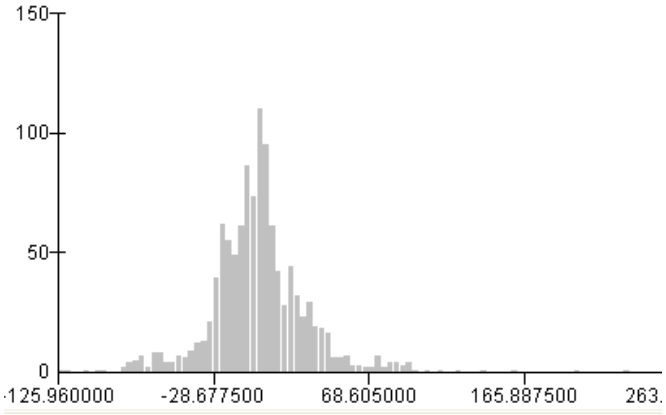
Transient Heads

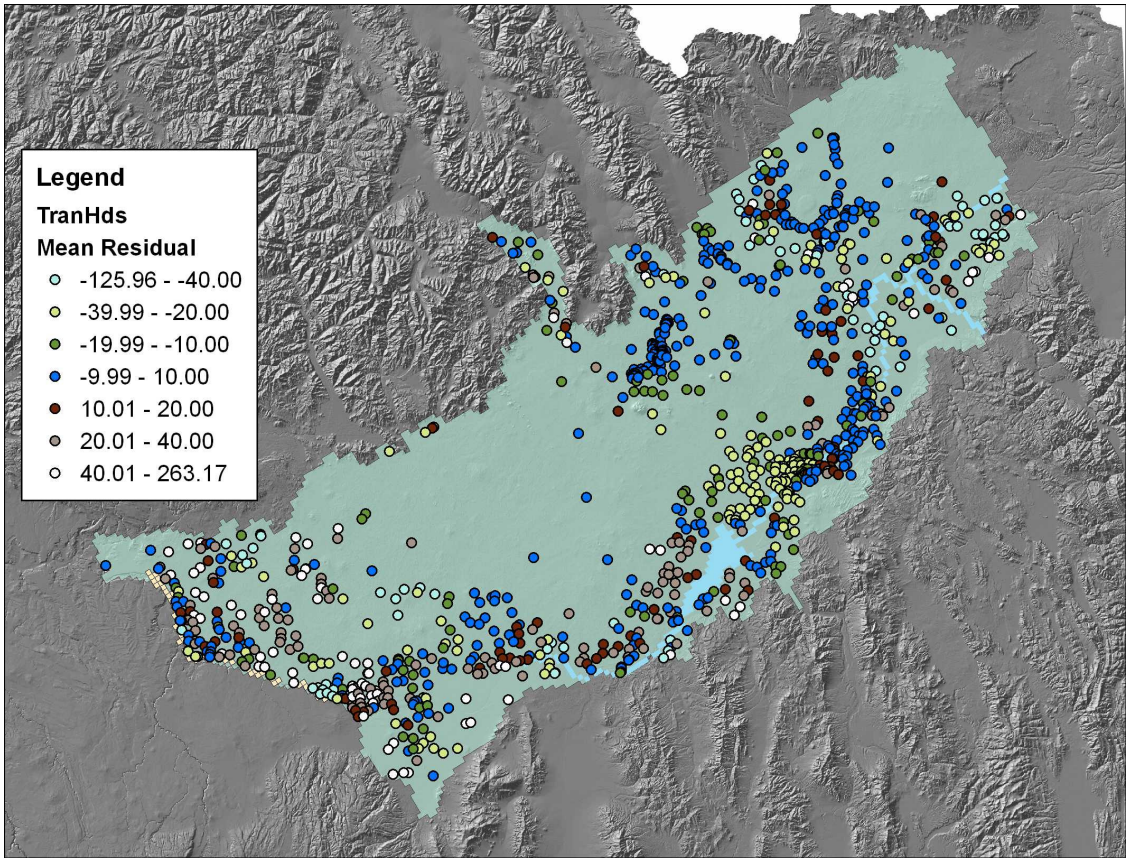
Mean = -2.10

Standard Deviation = 21.87

1st quartile = -12.04

3rd quartile = 6.78





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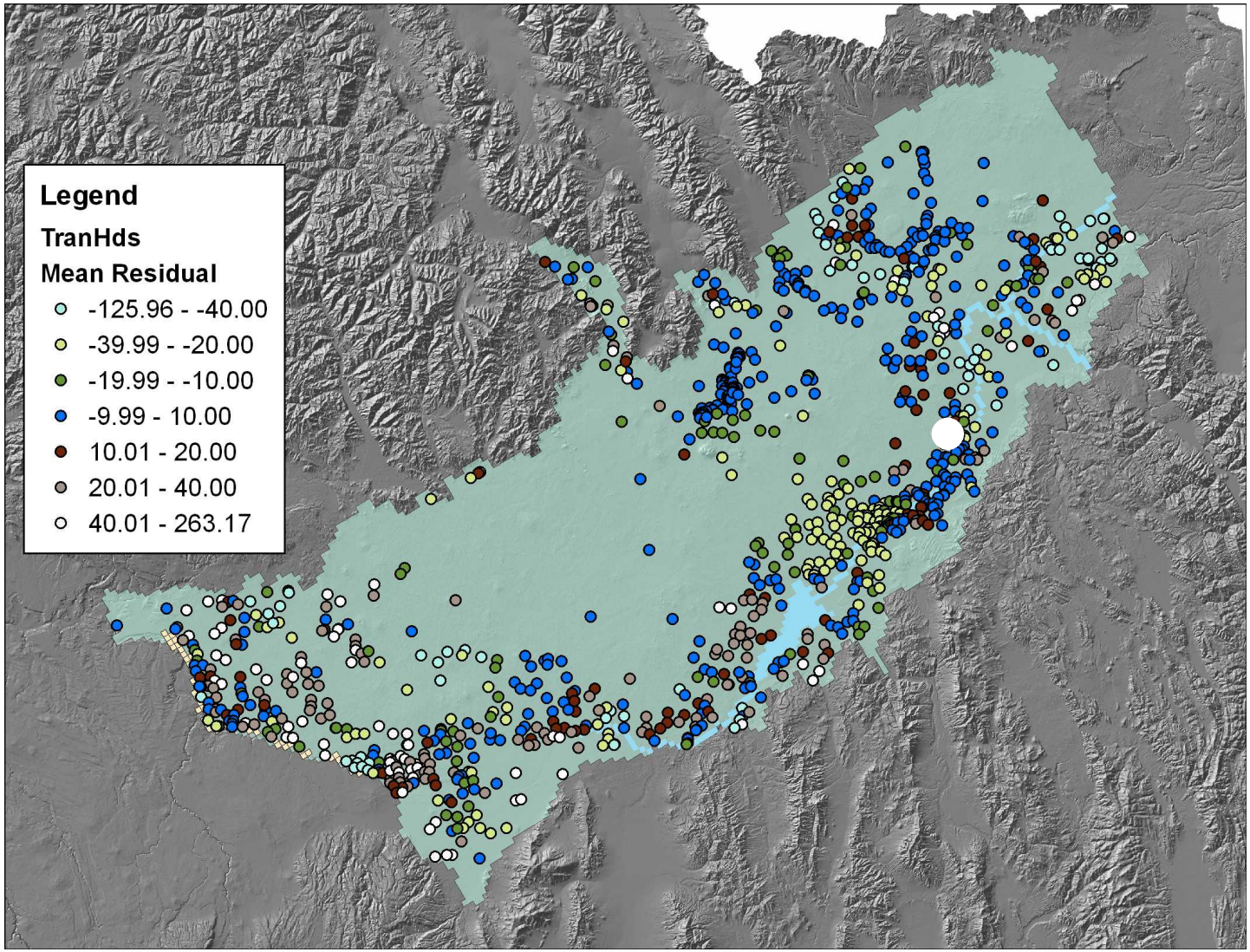

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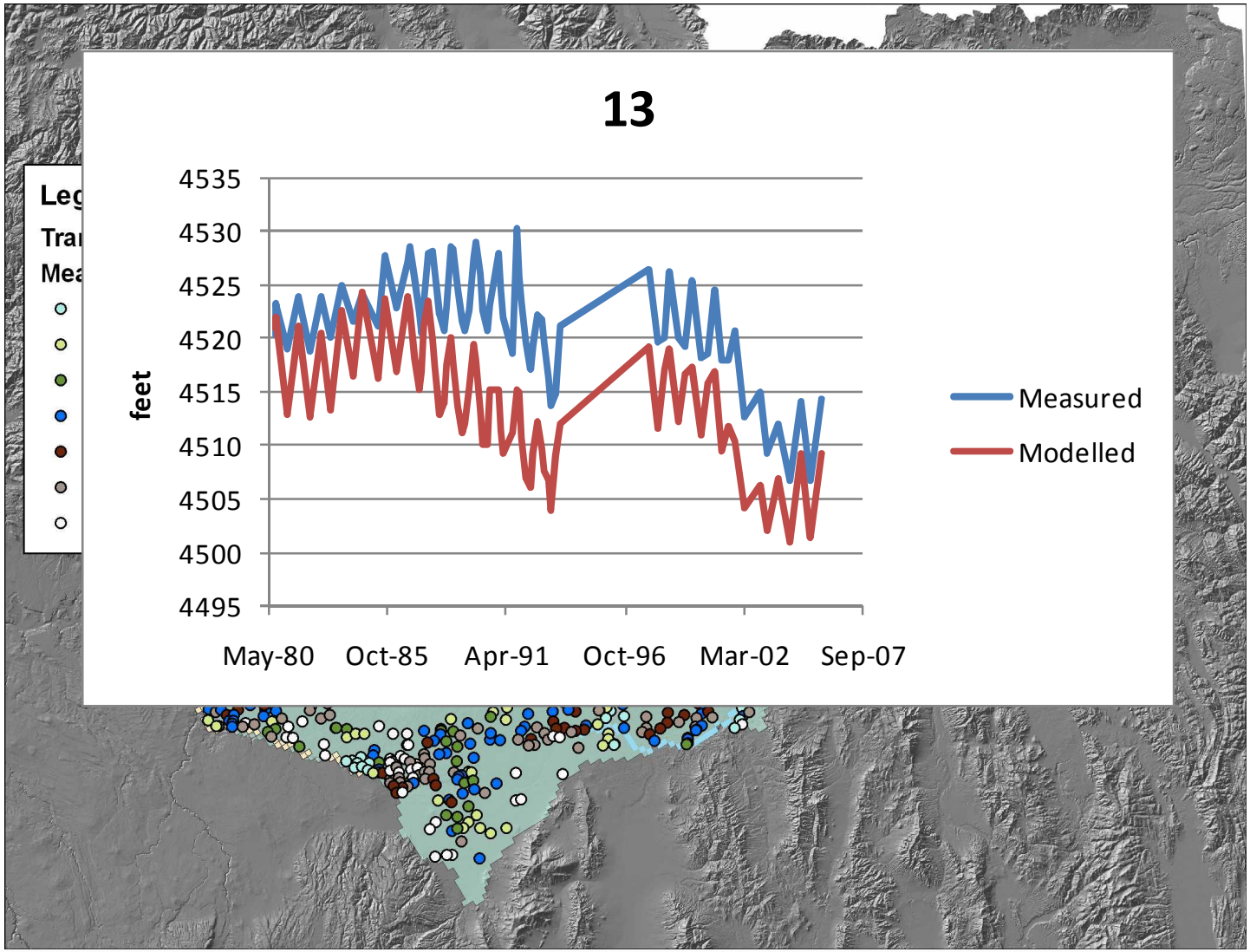

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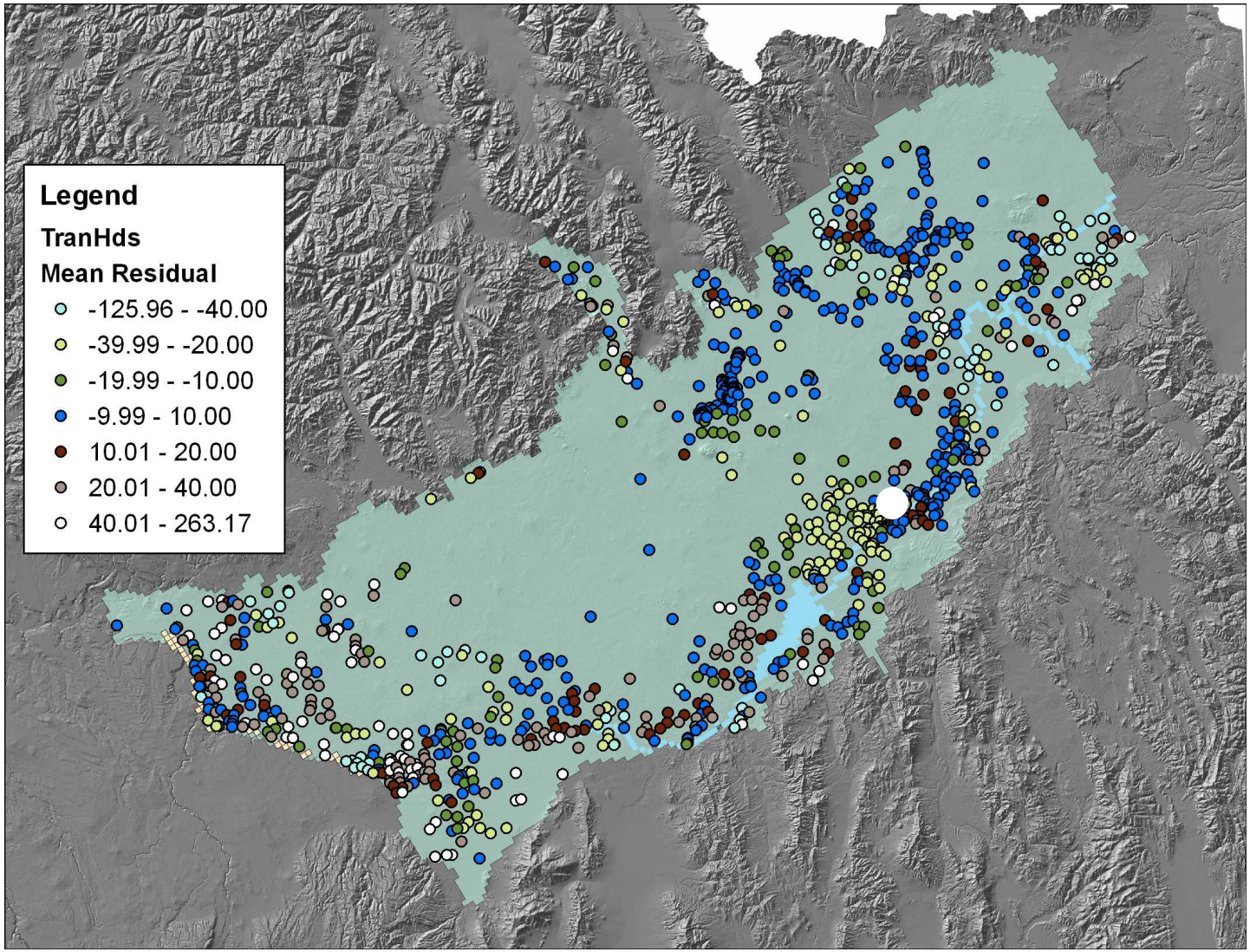

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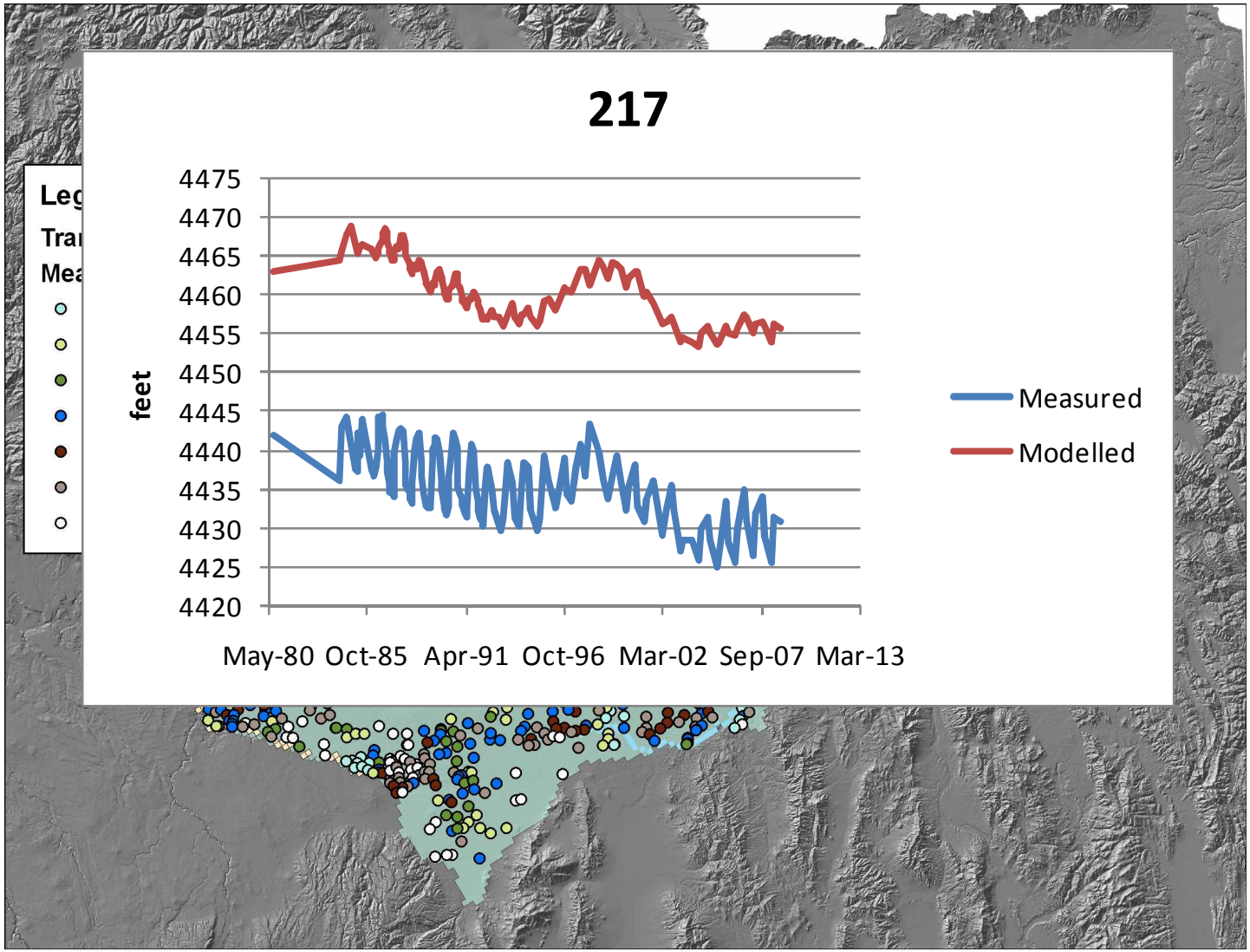

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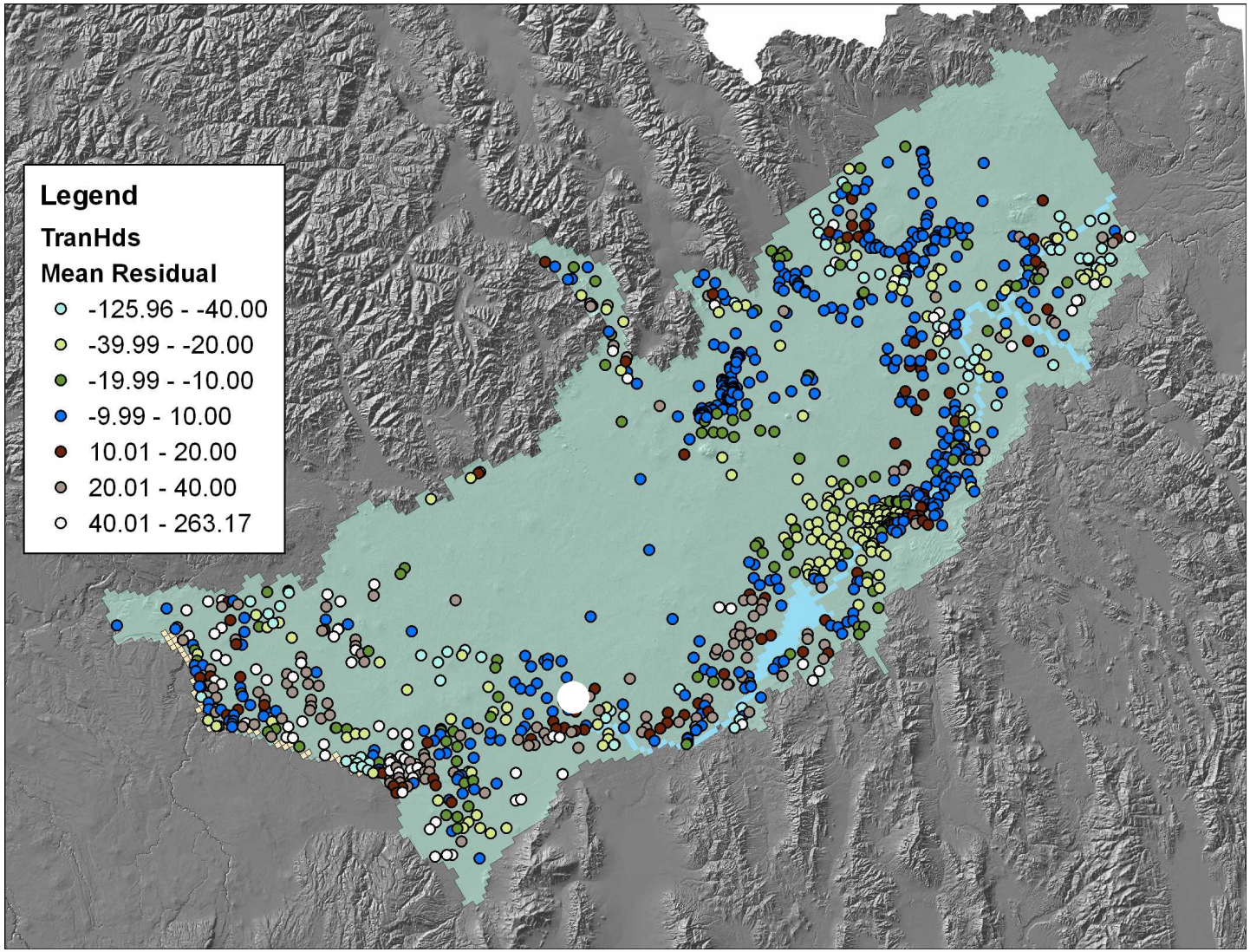

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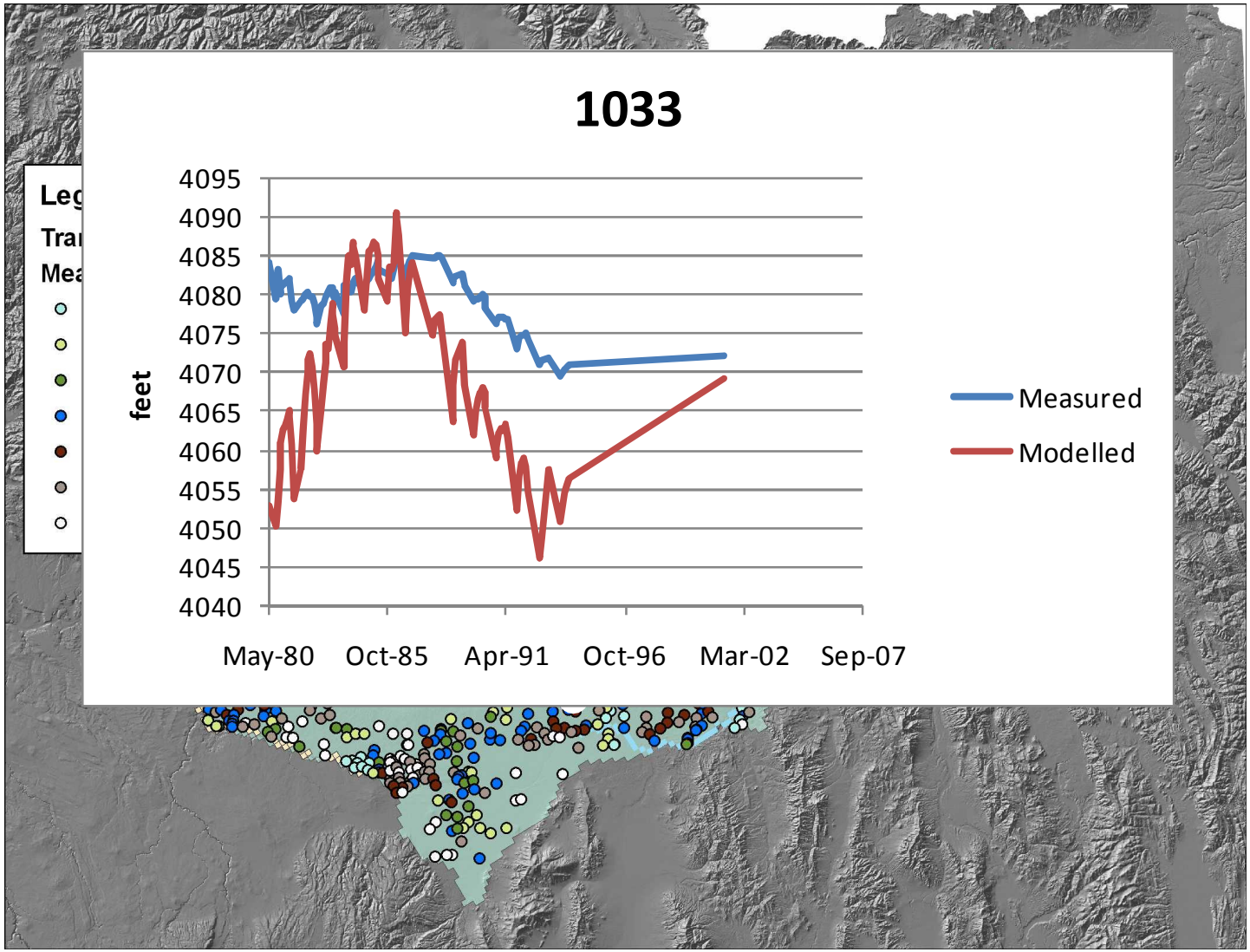

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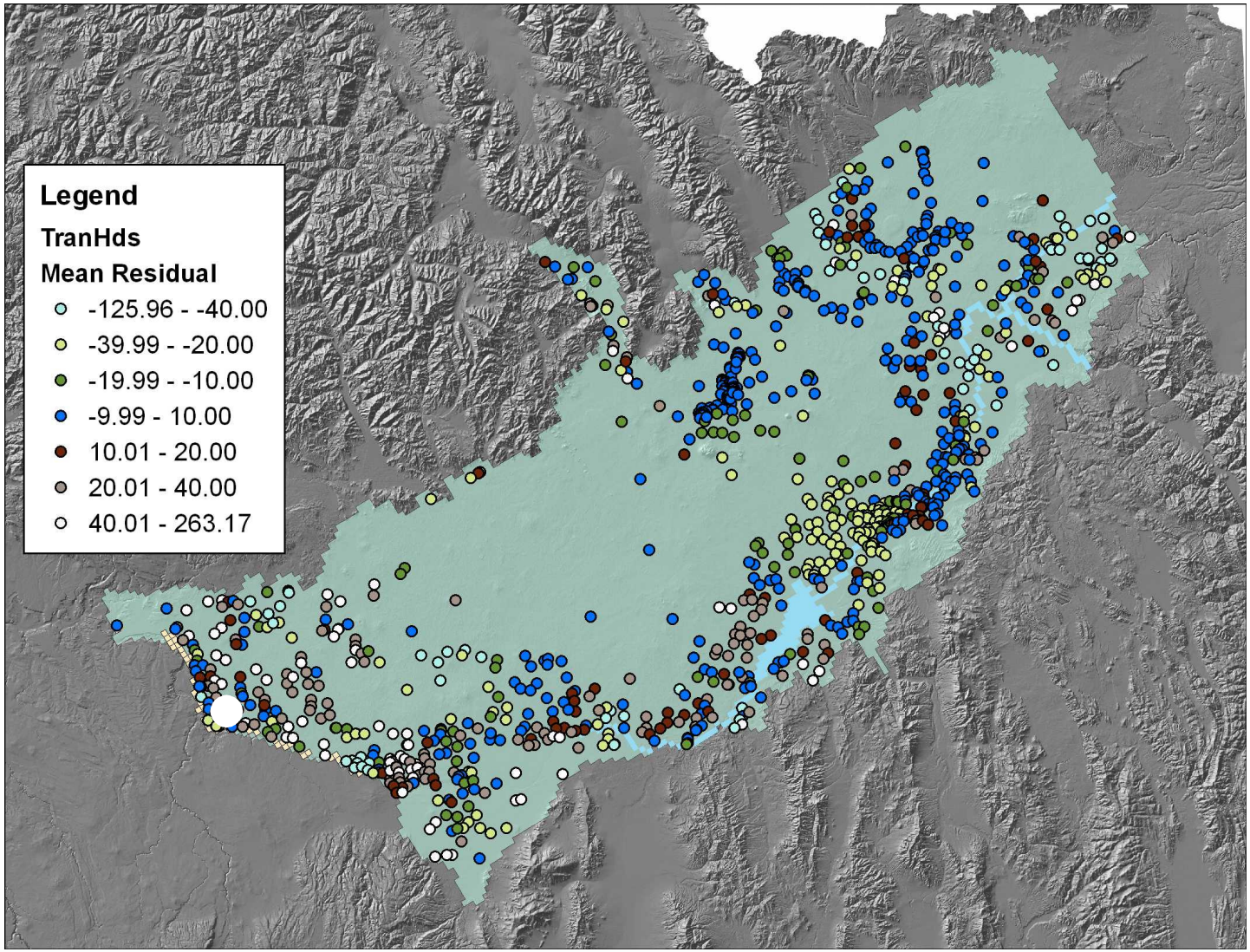

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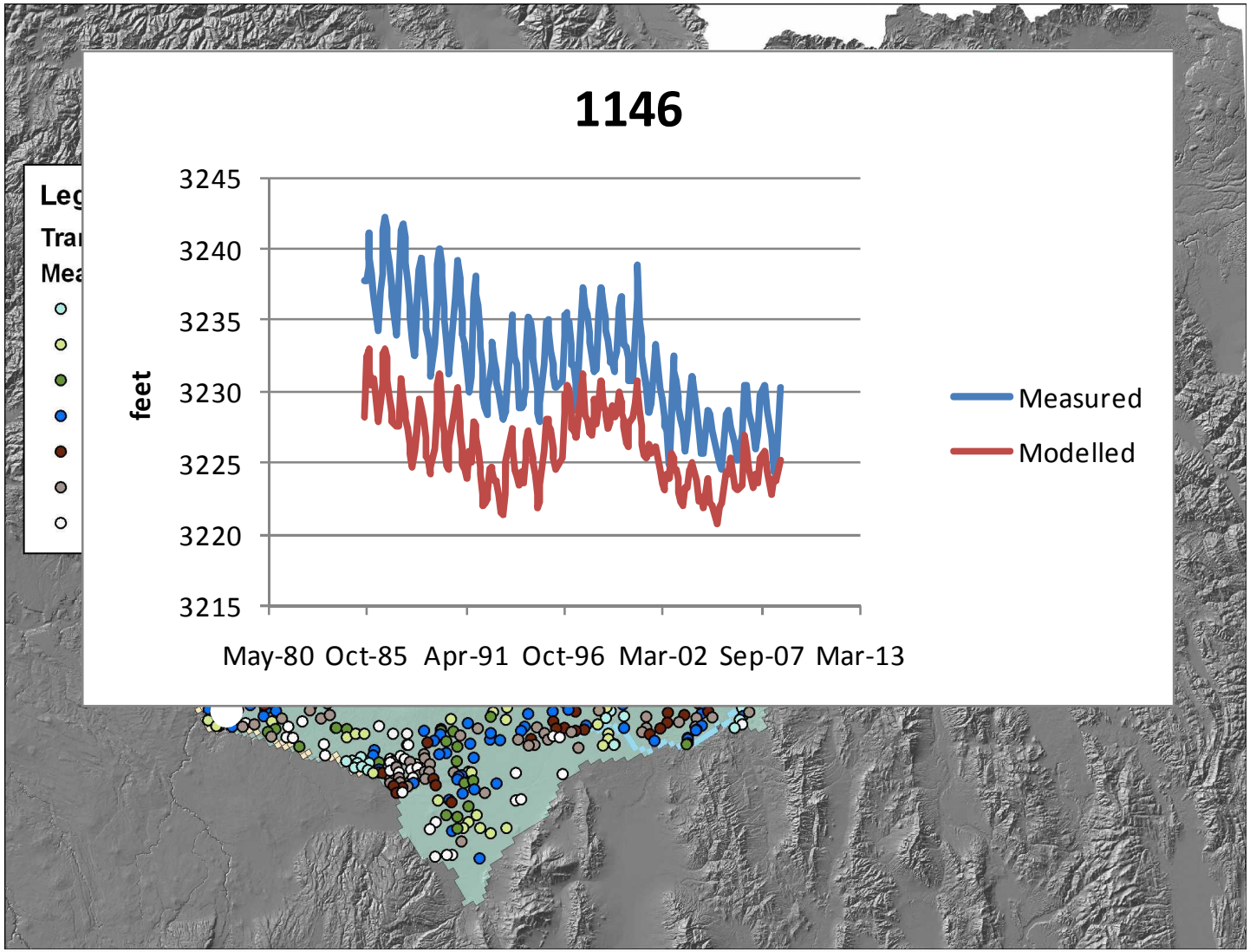

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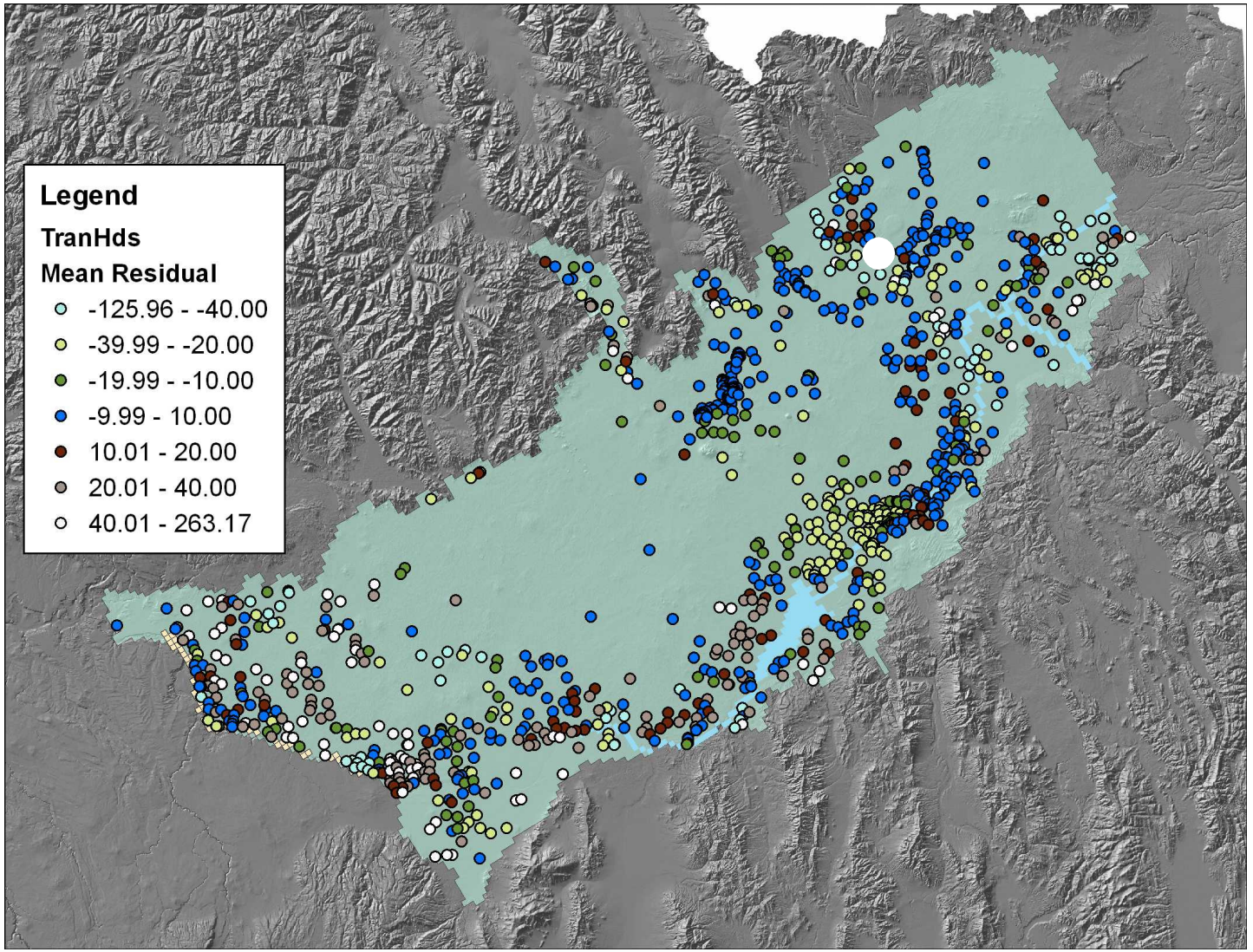
Transient Heads



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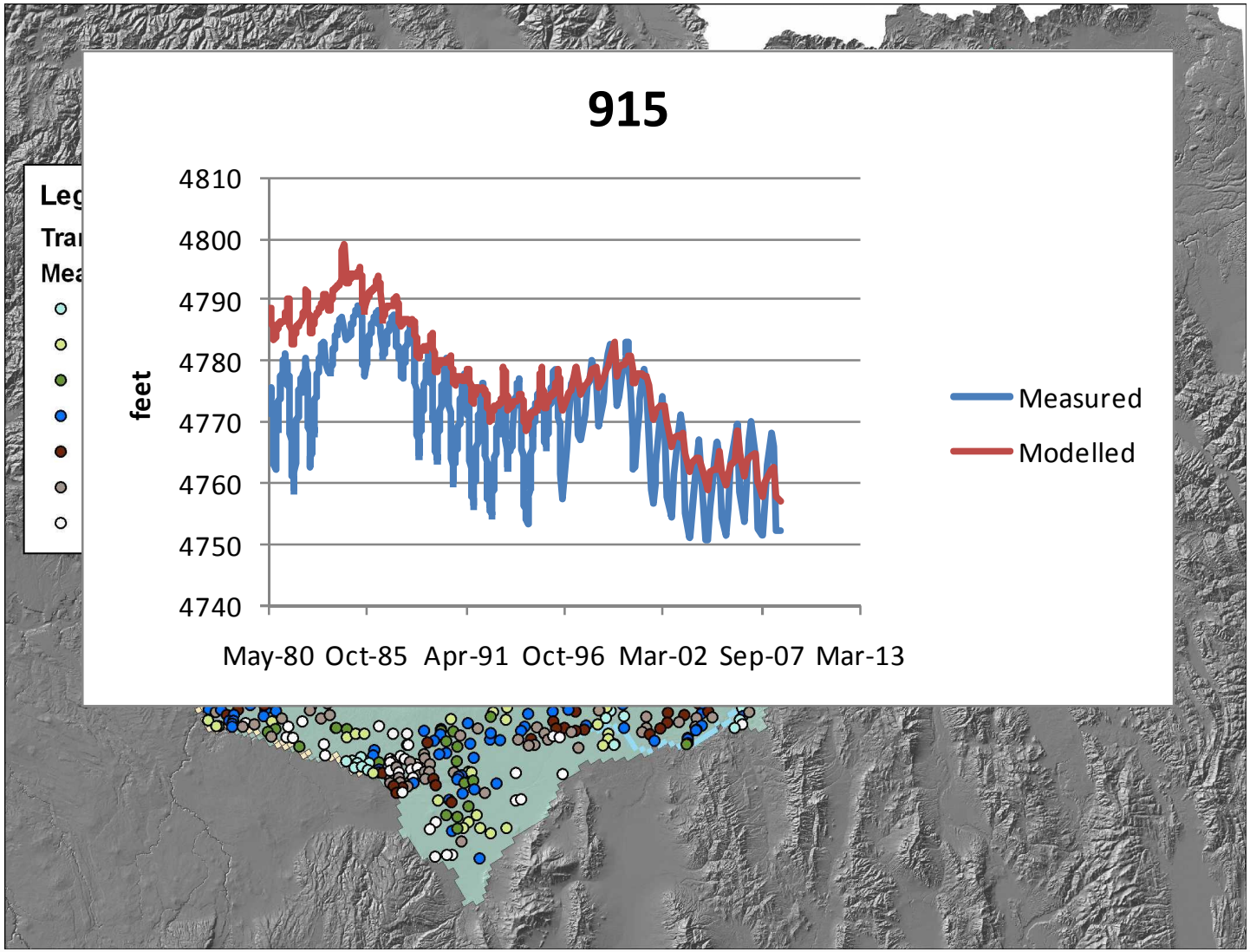

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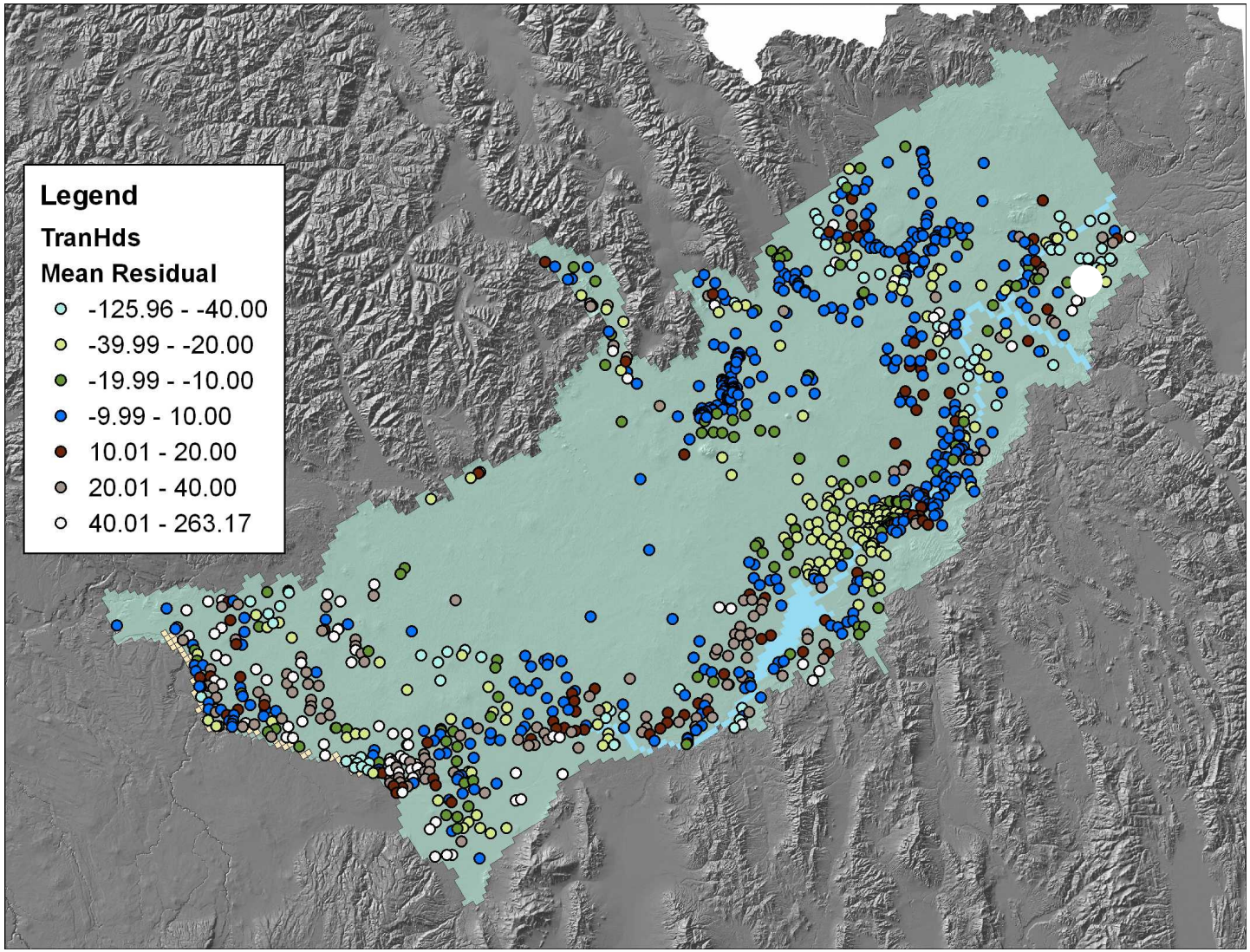

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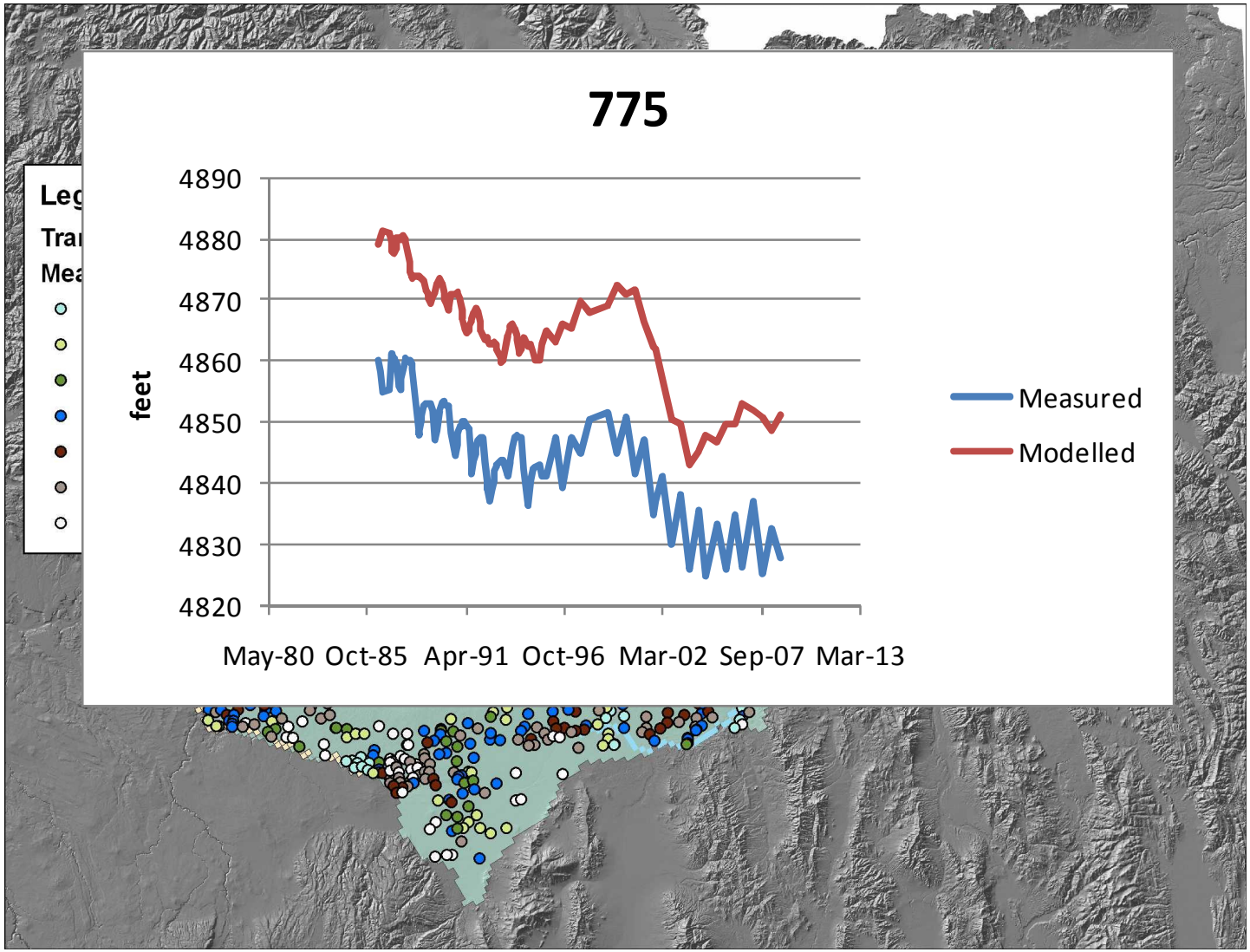

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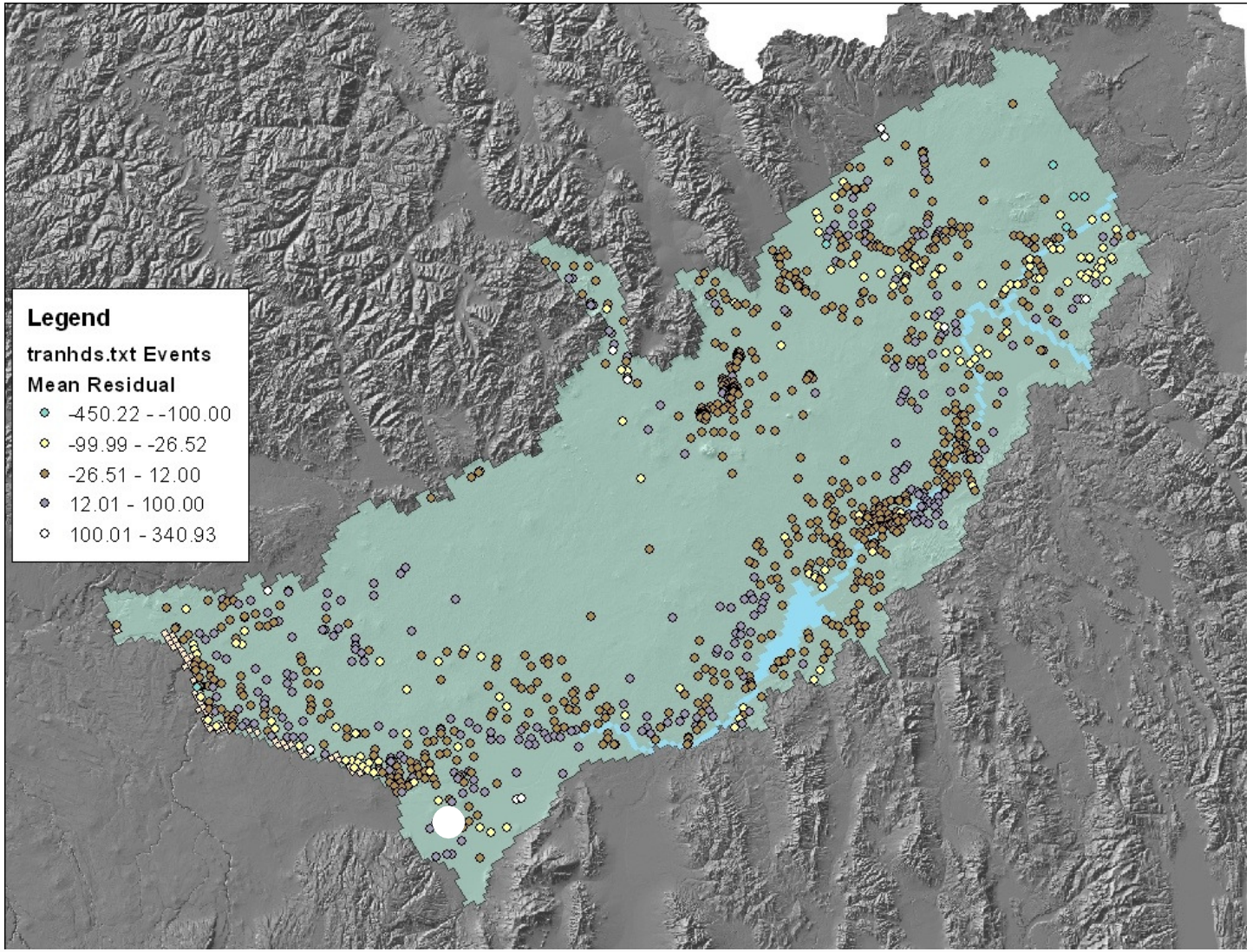

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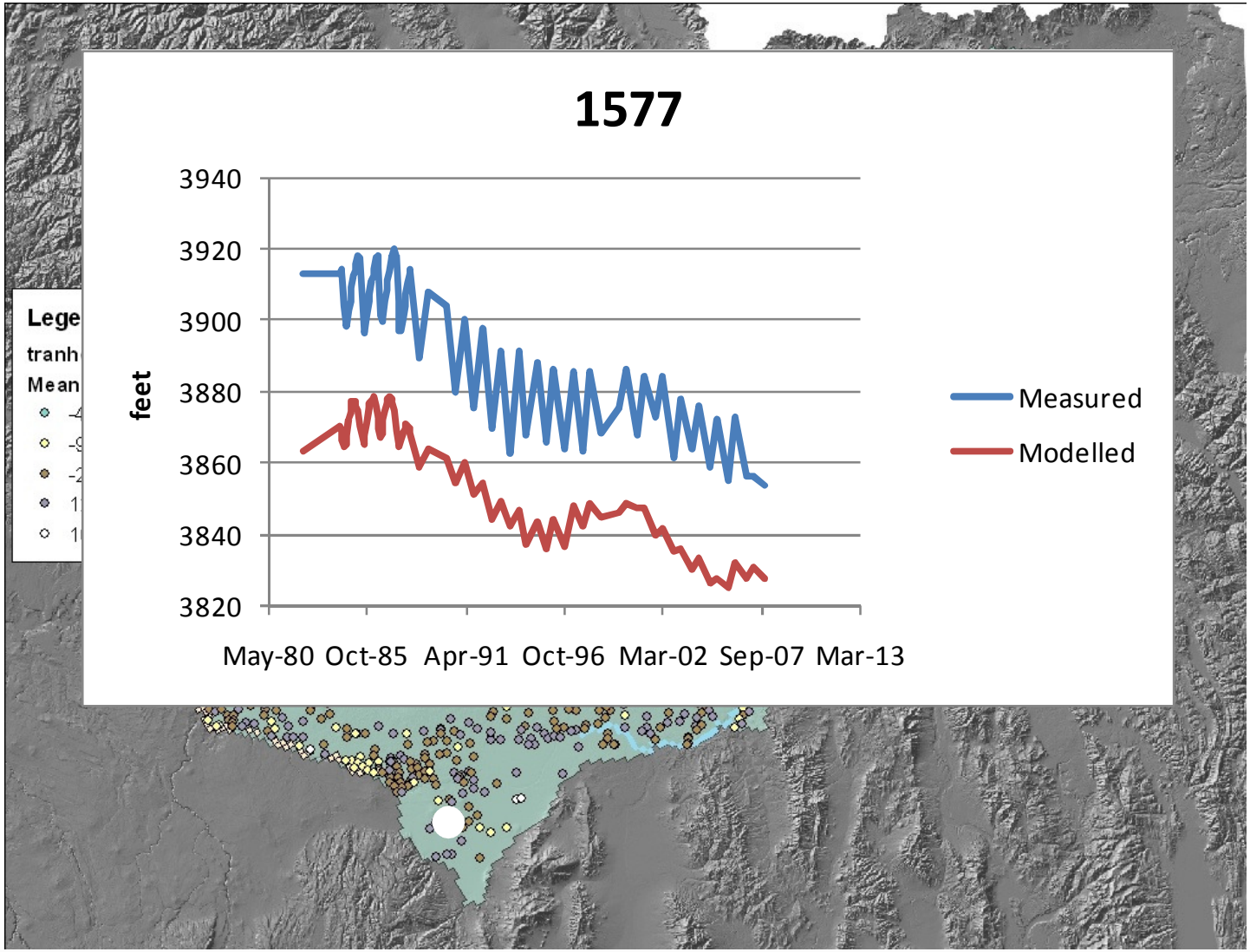

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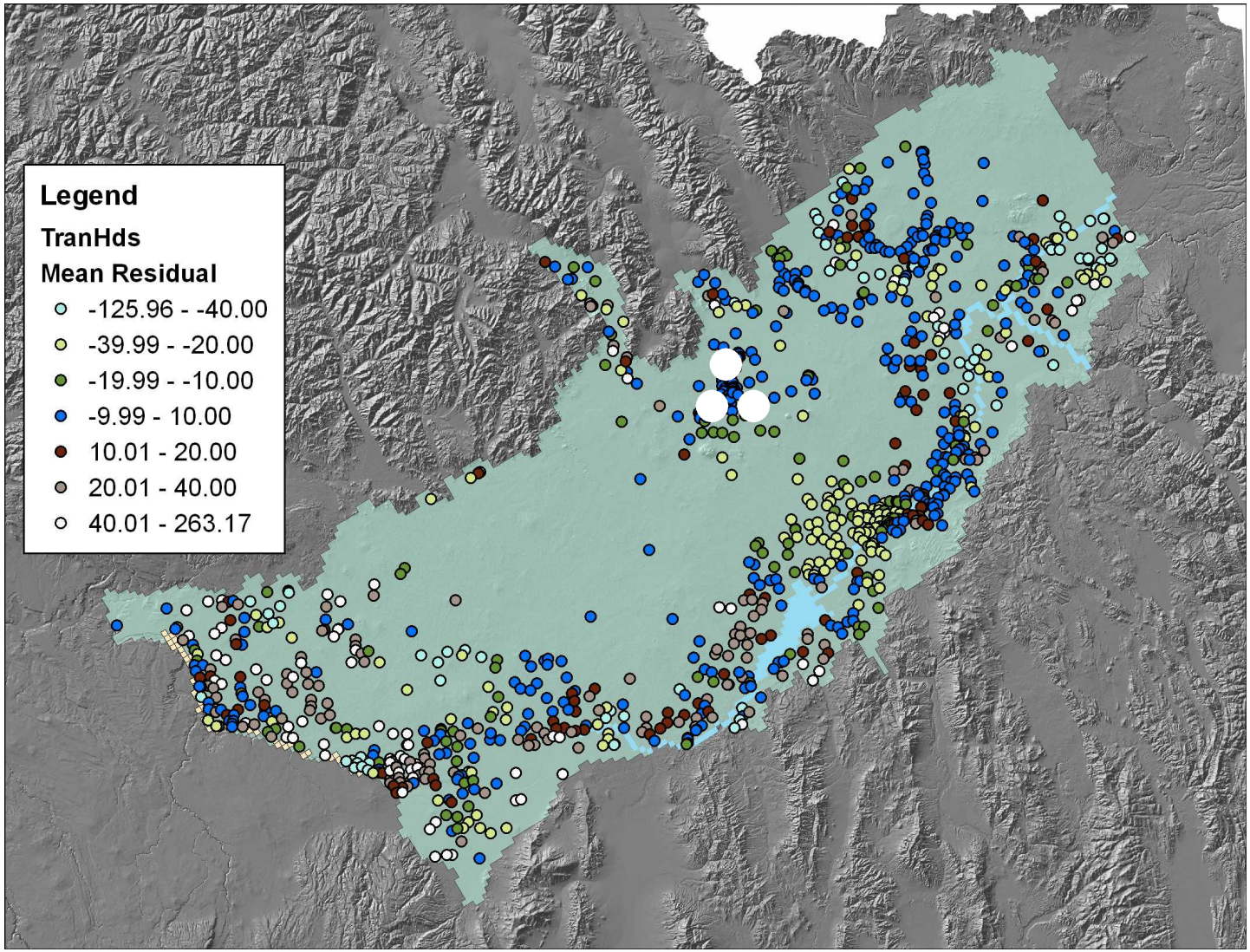

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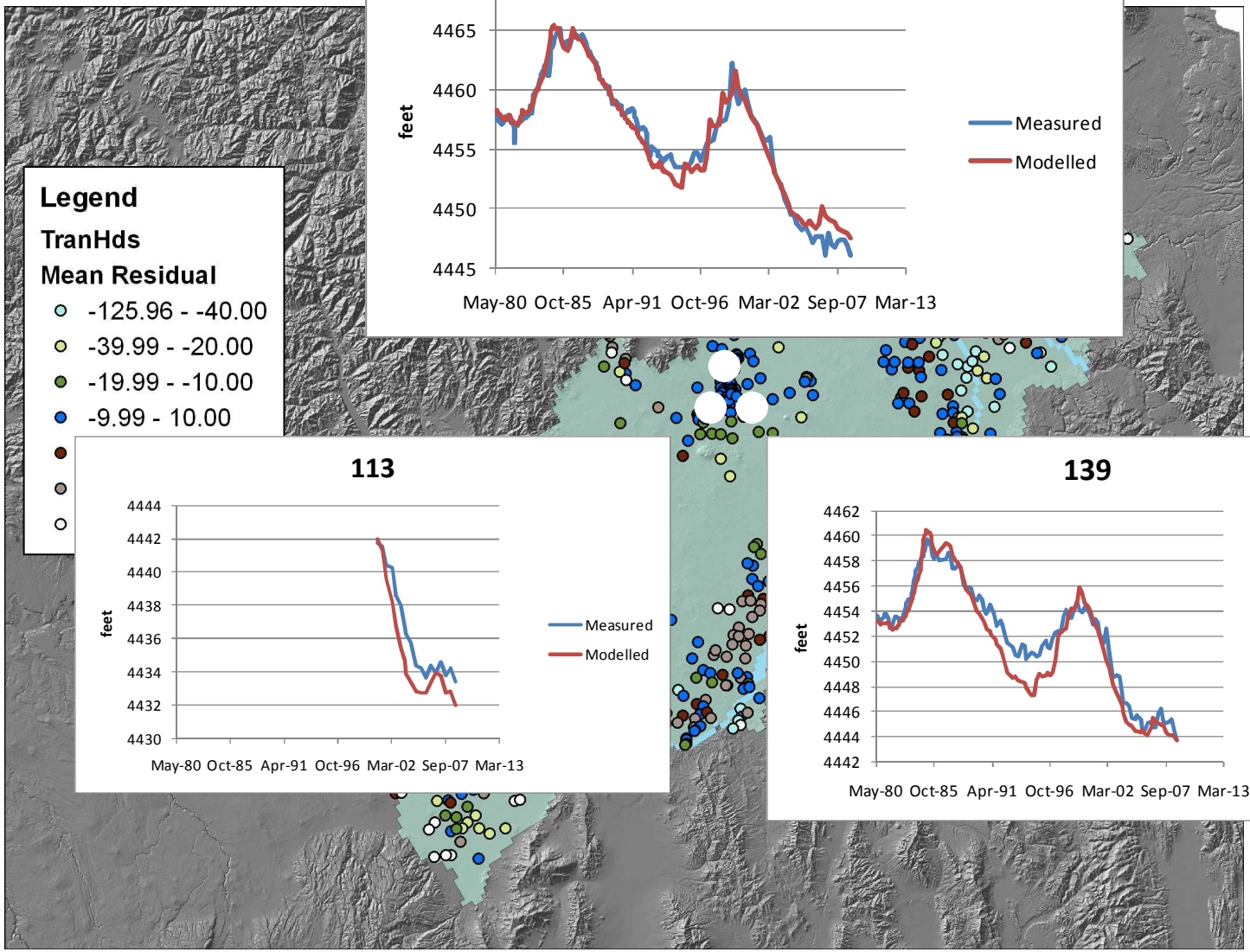

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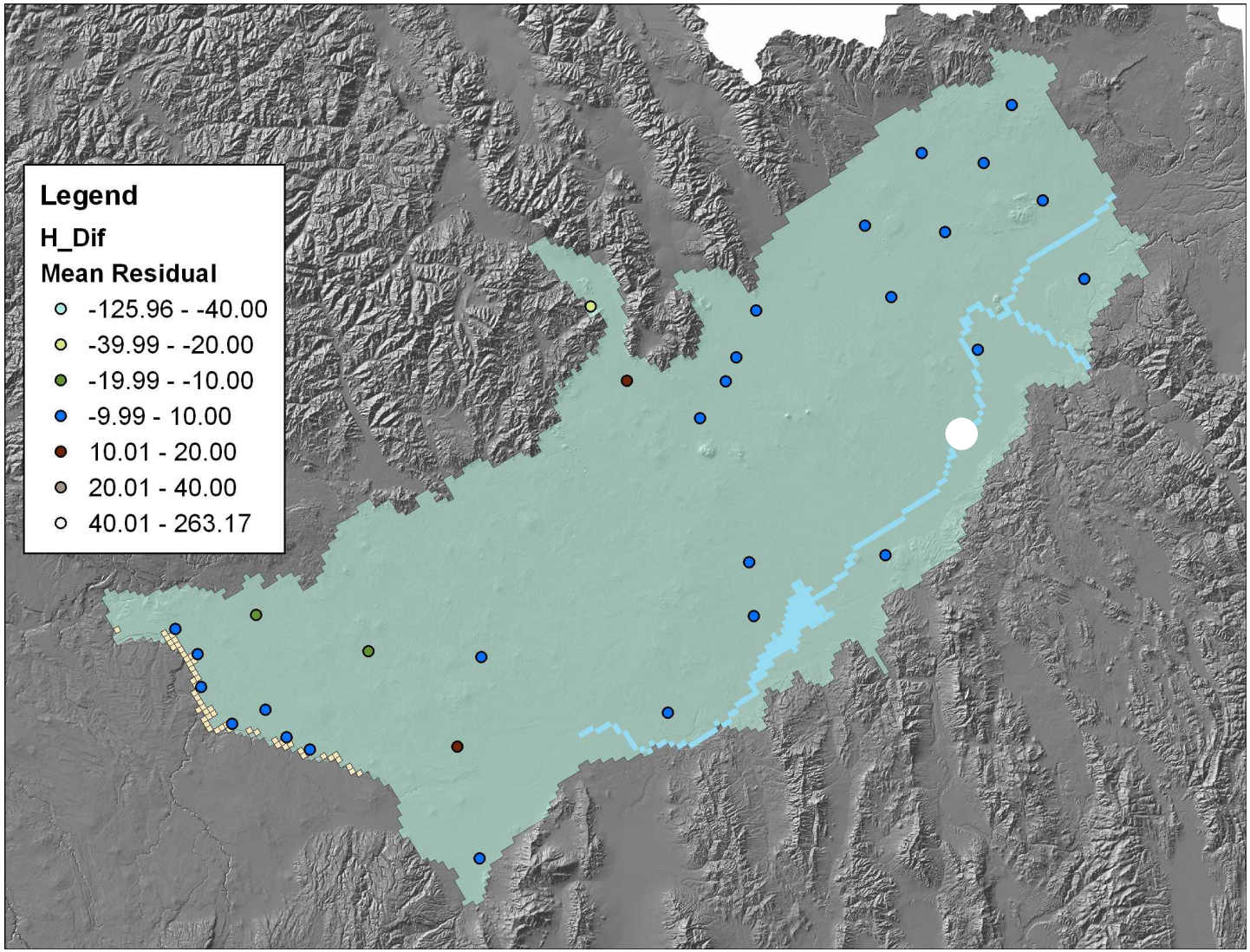

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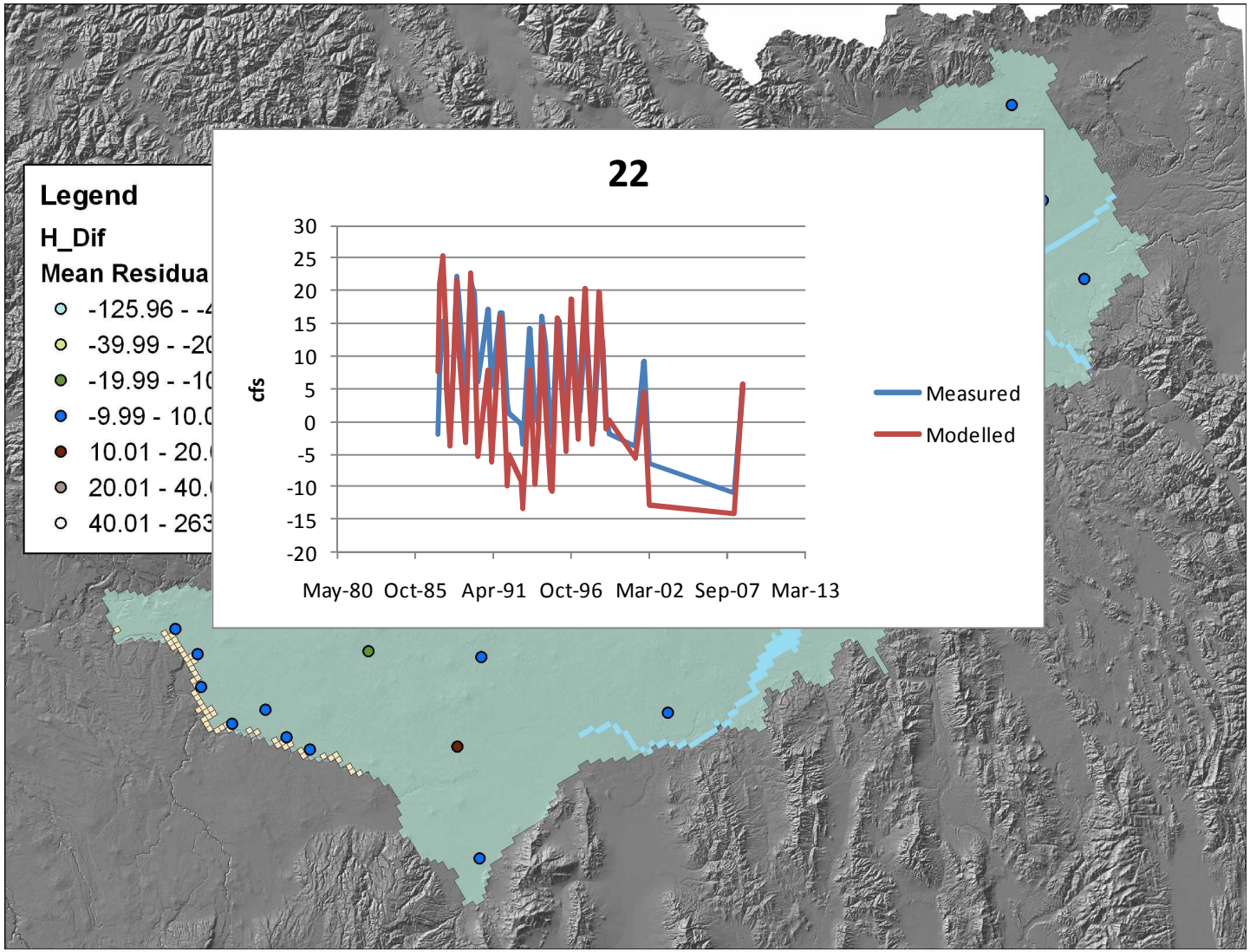

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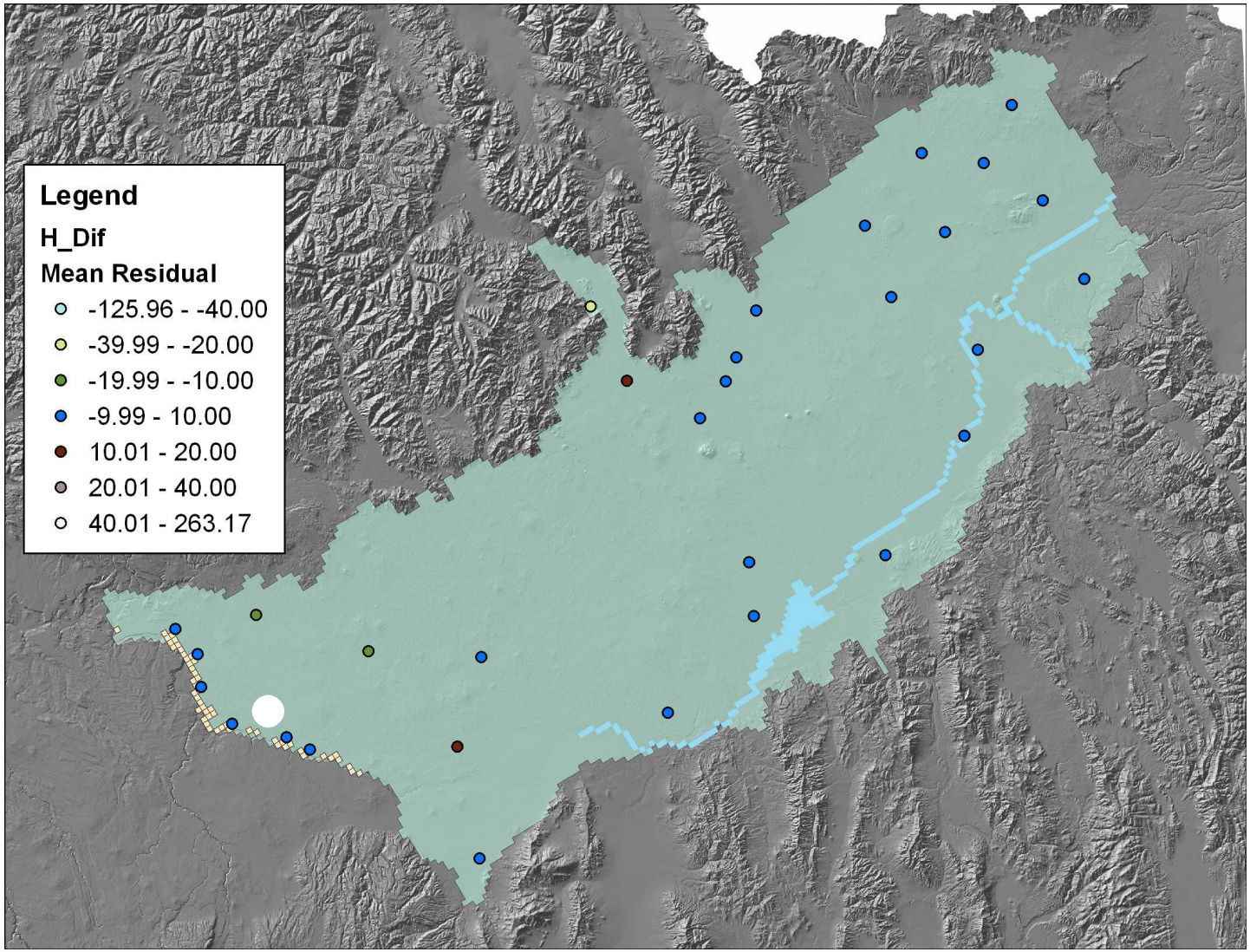

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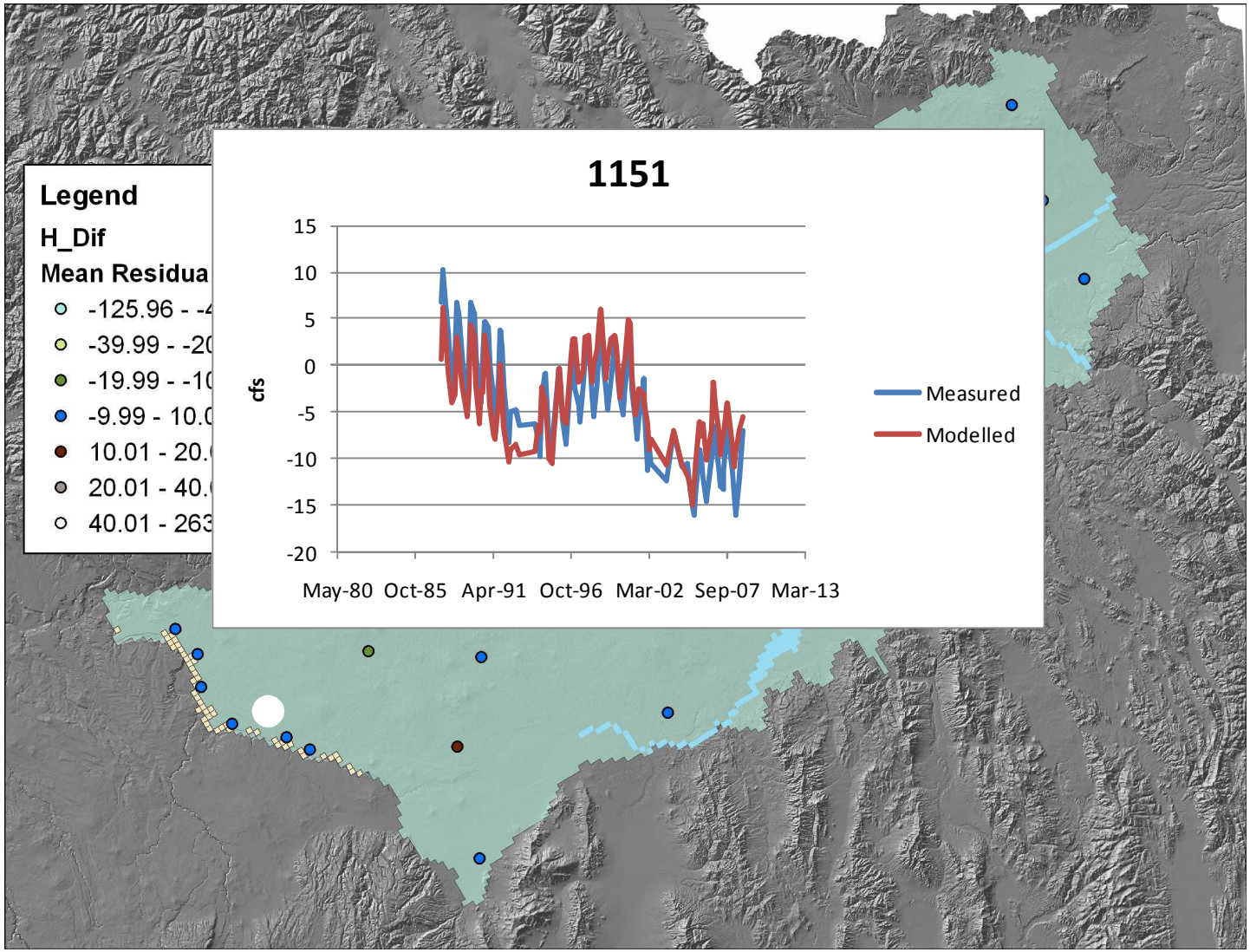
Transient Heads



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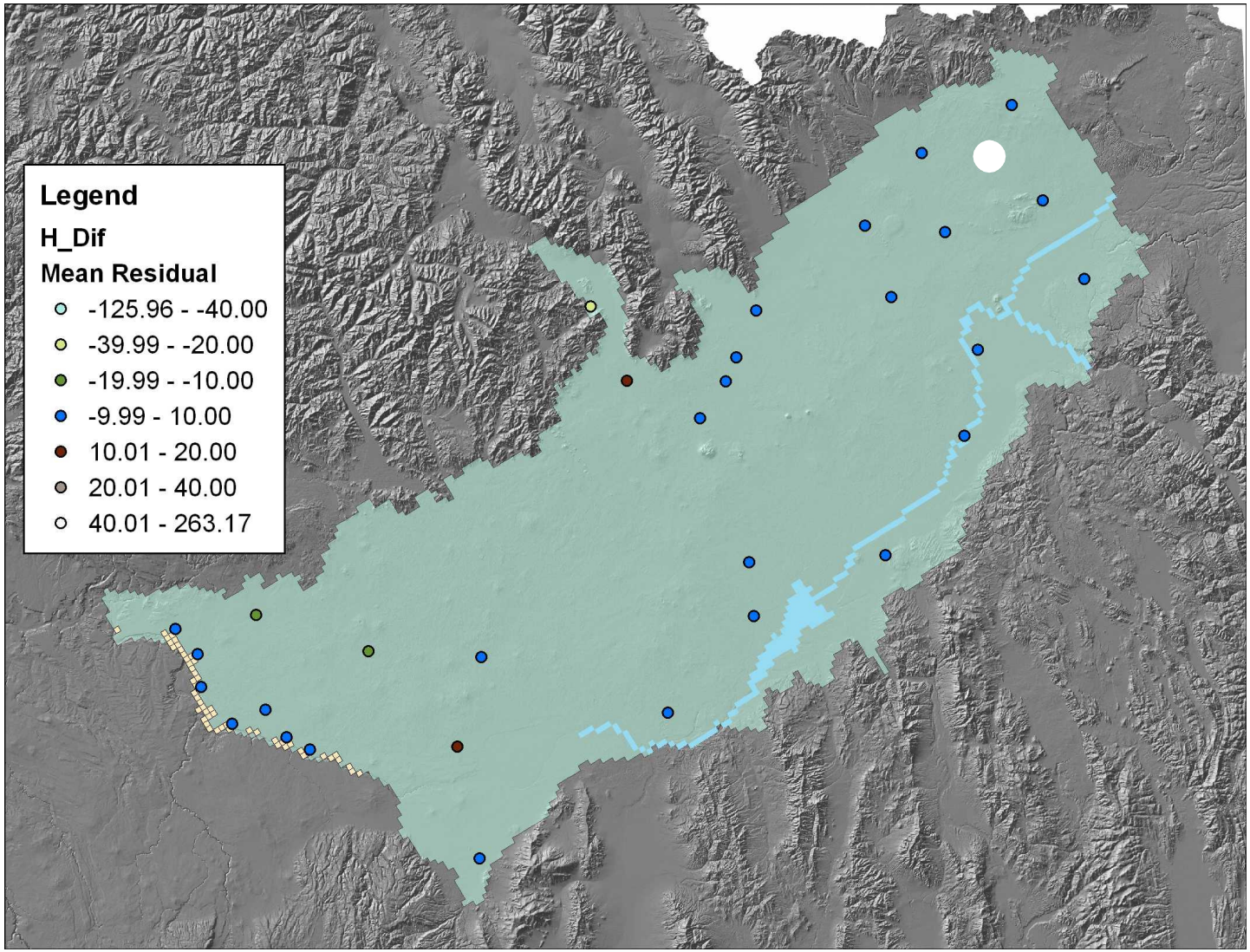

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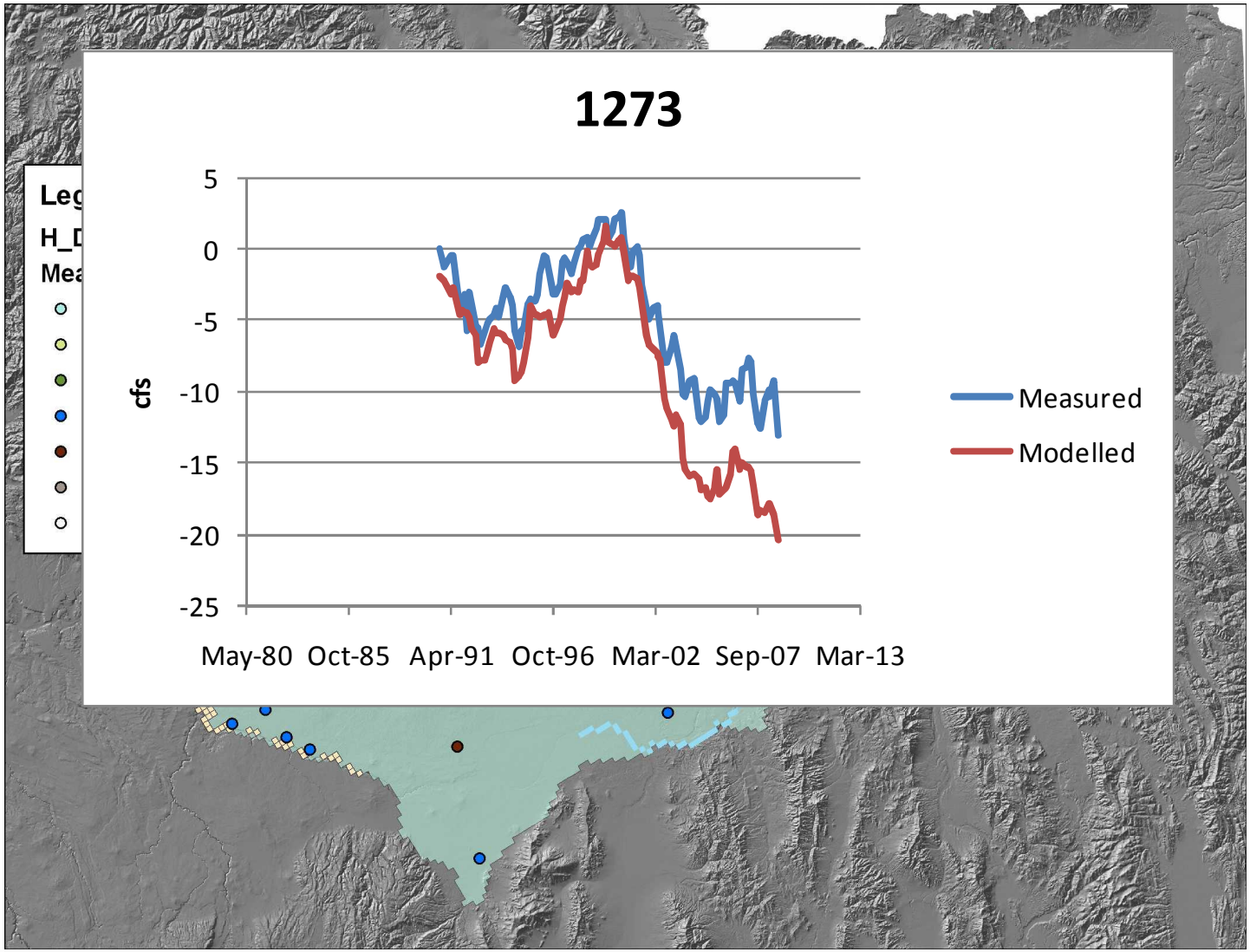

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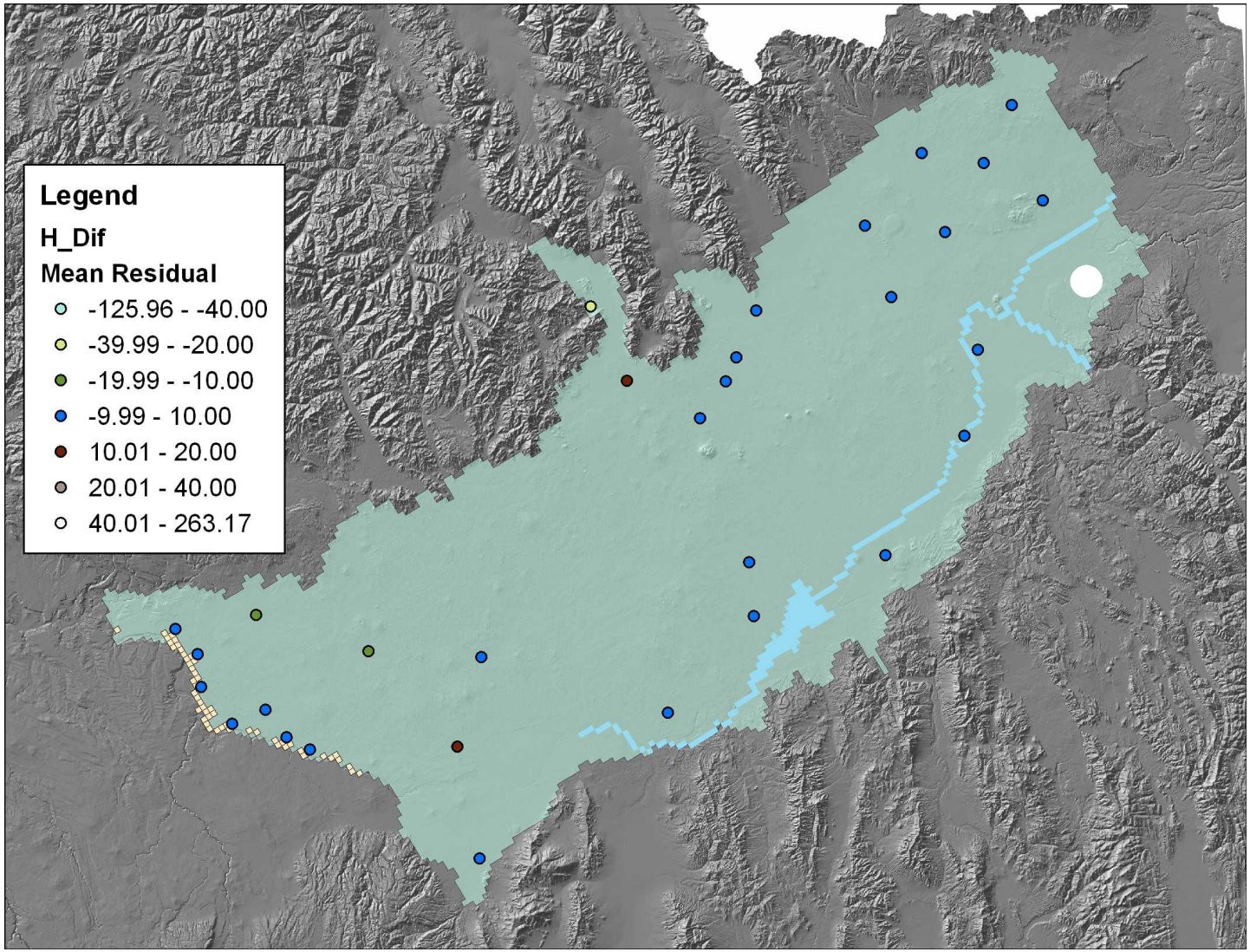

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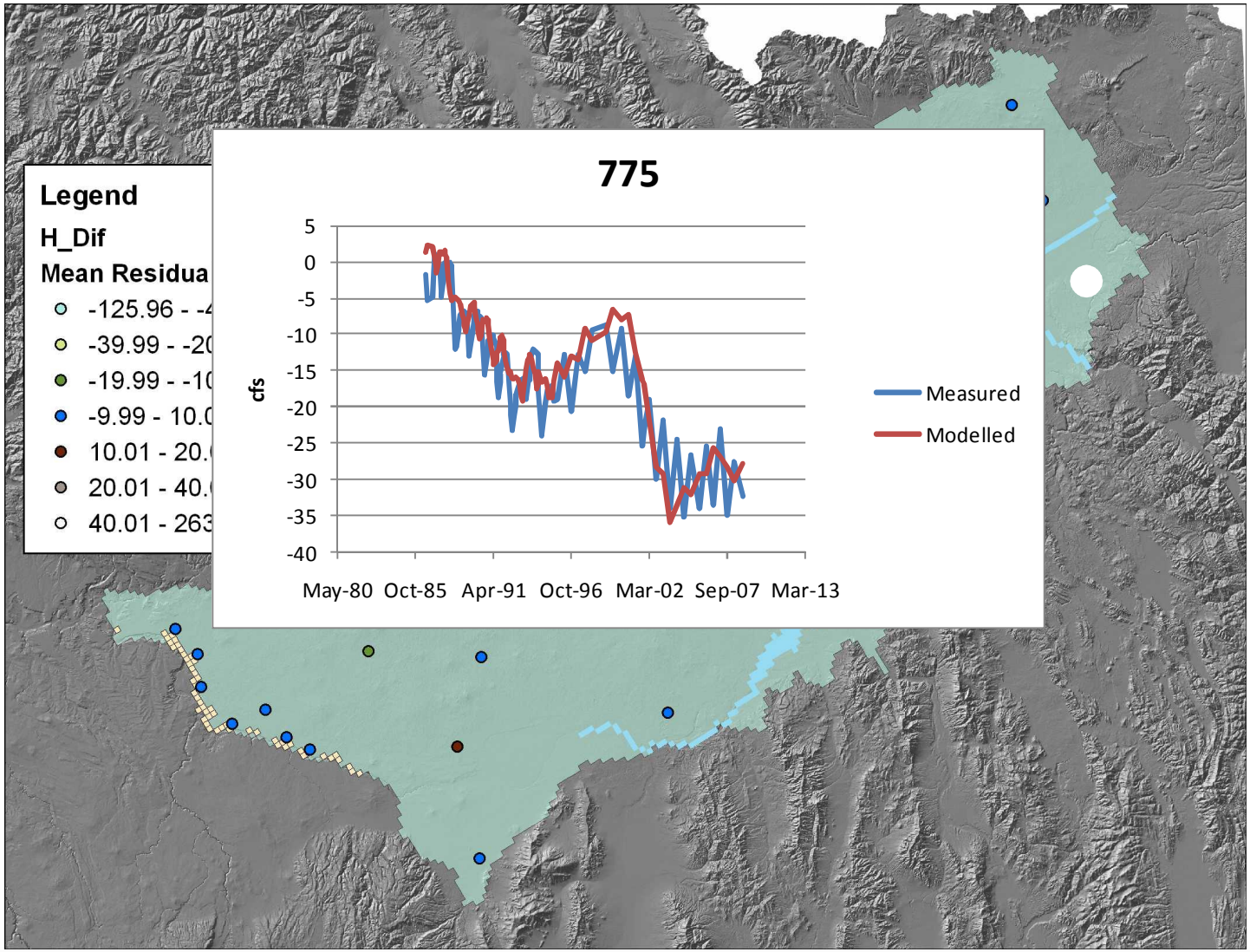
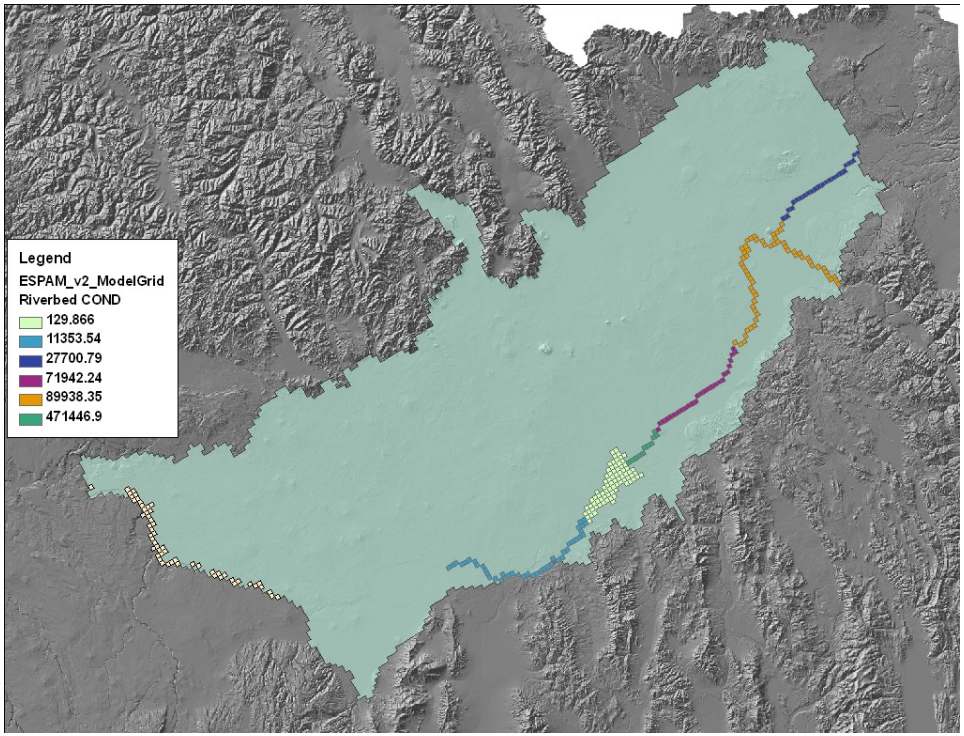
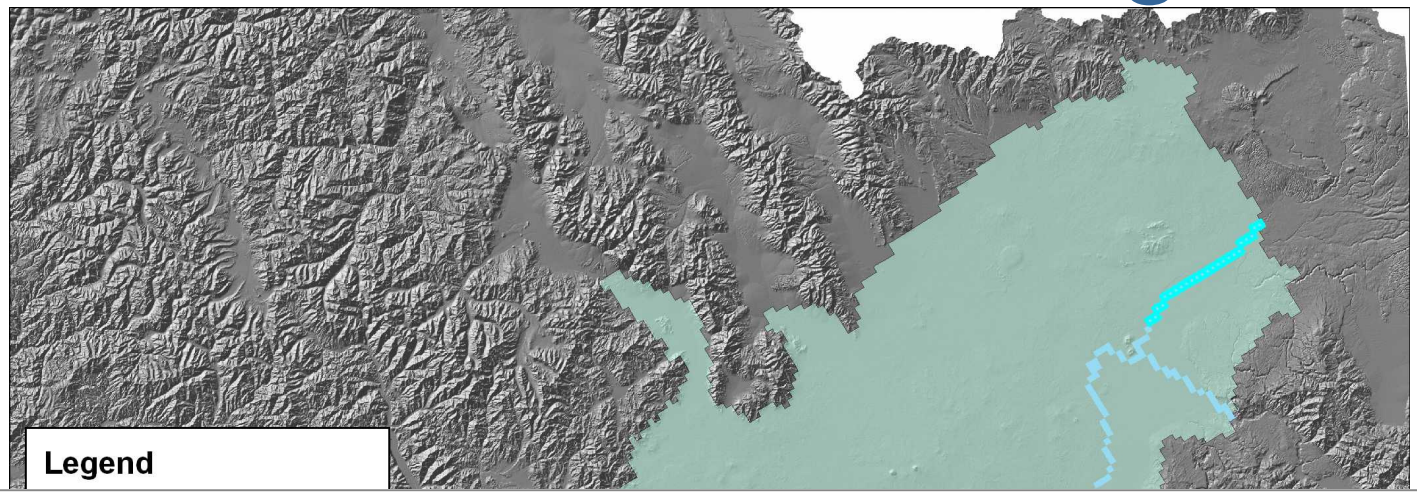
Transient Heads

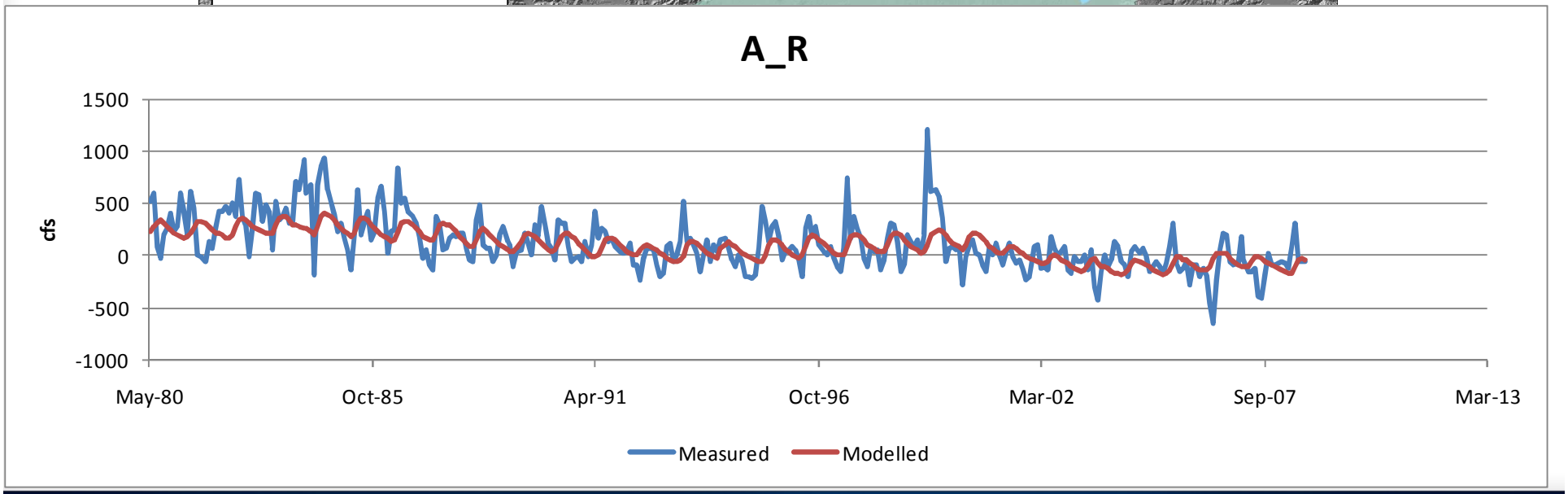




- Snake River reaches

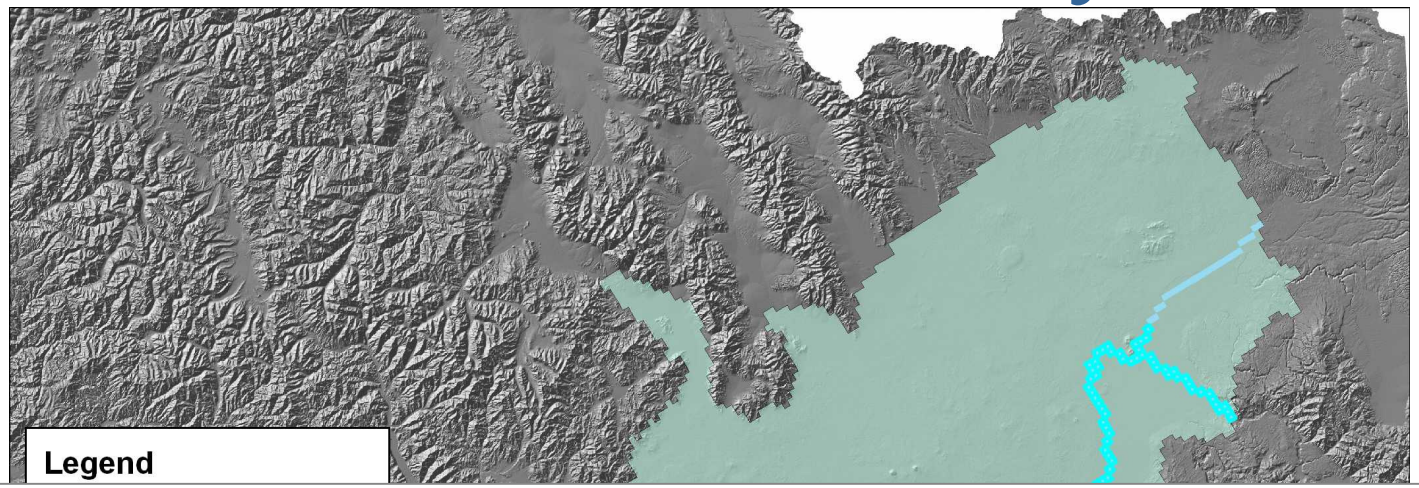
Ashton - Rexburg

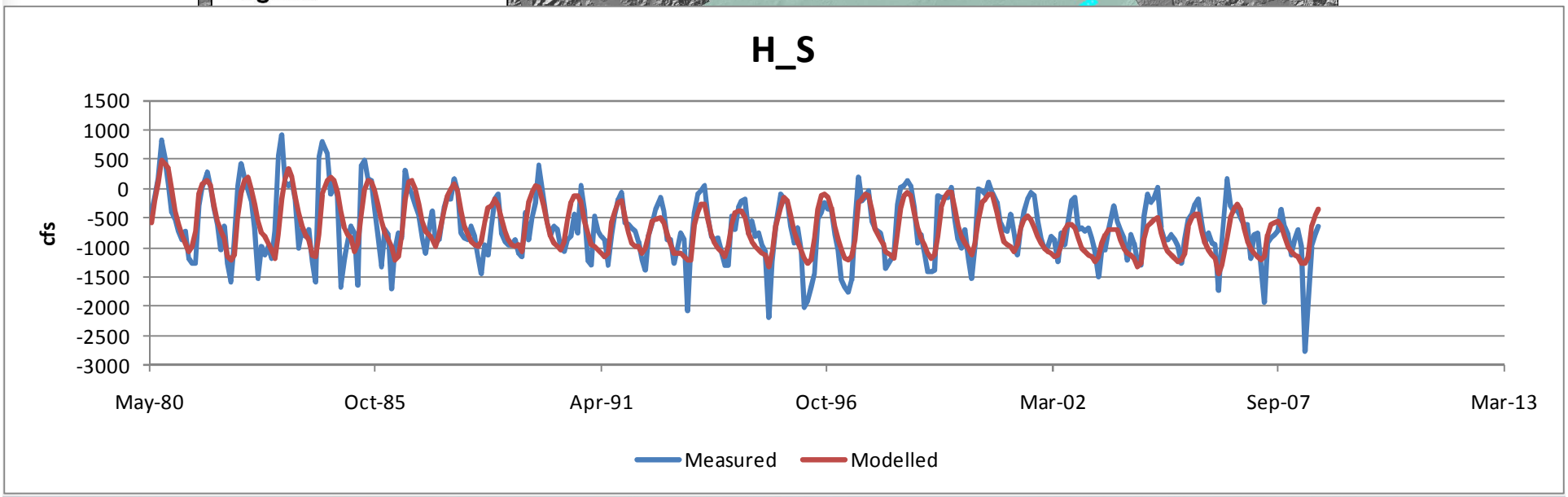




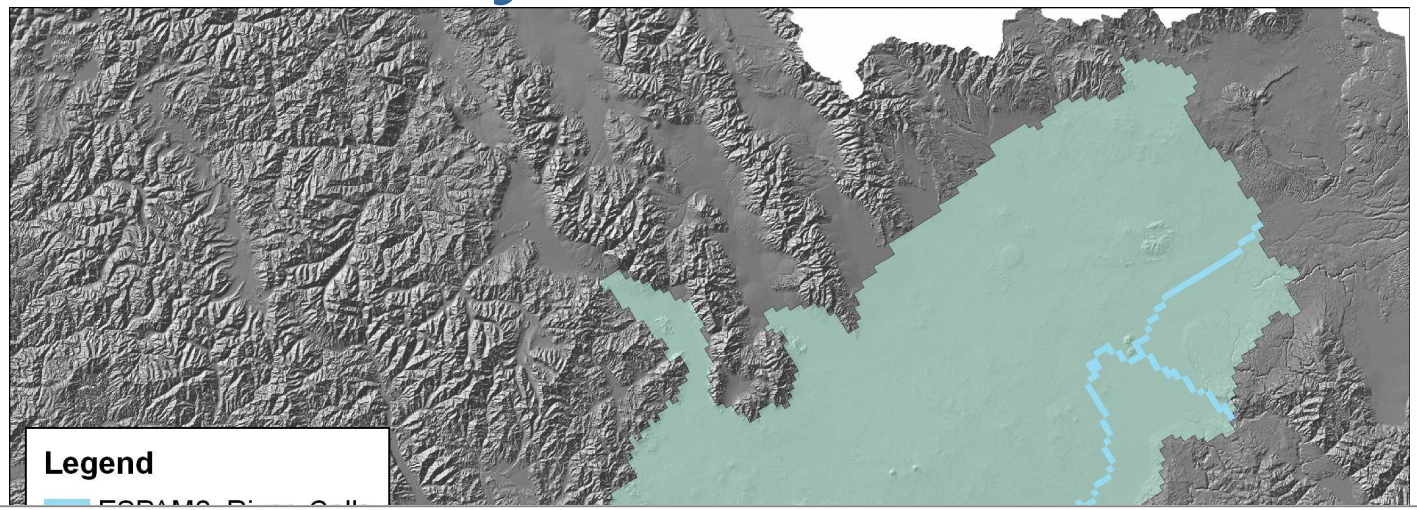
IDAHO Department of Water Resources

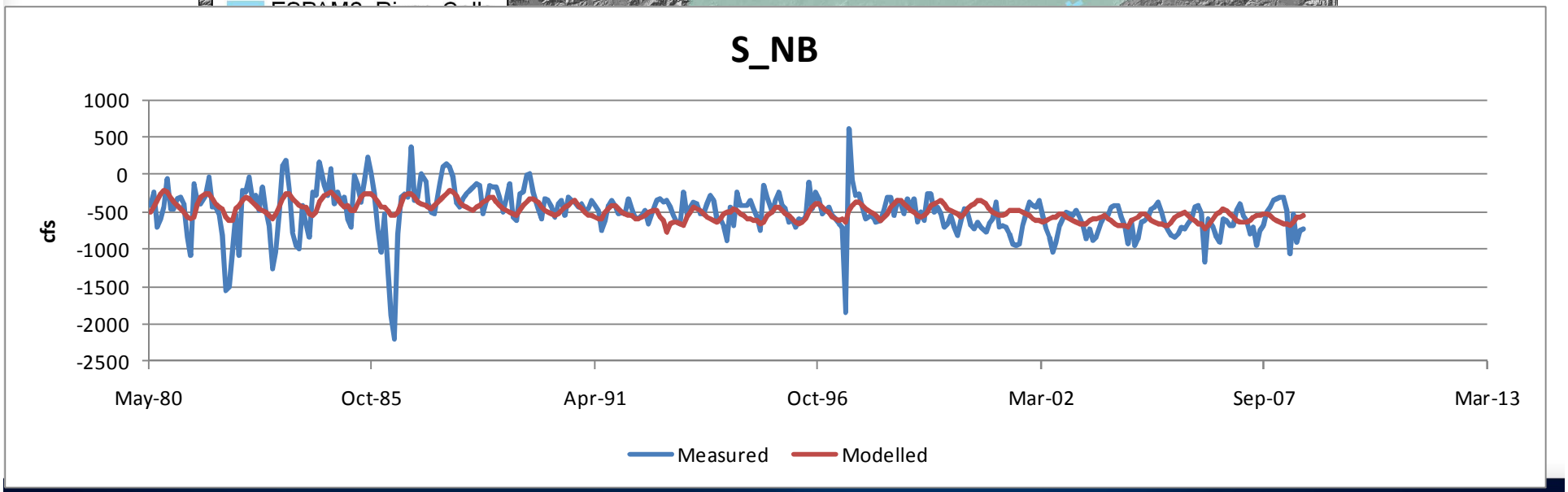
Heise - Shelley



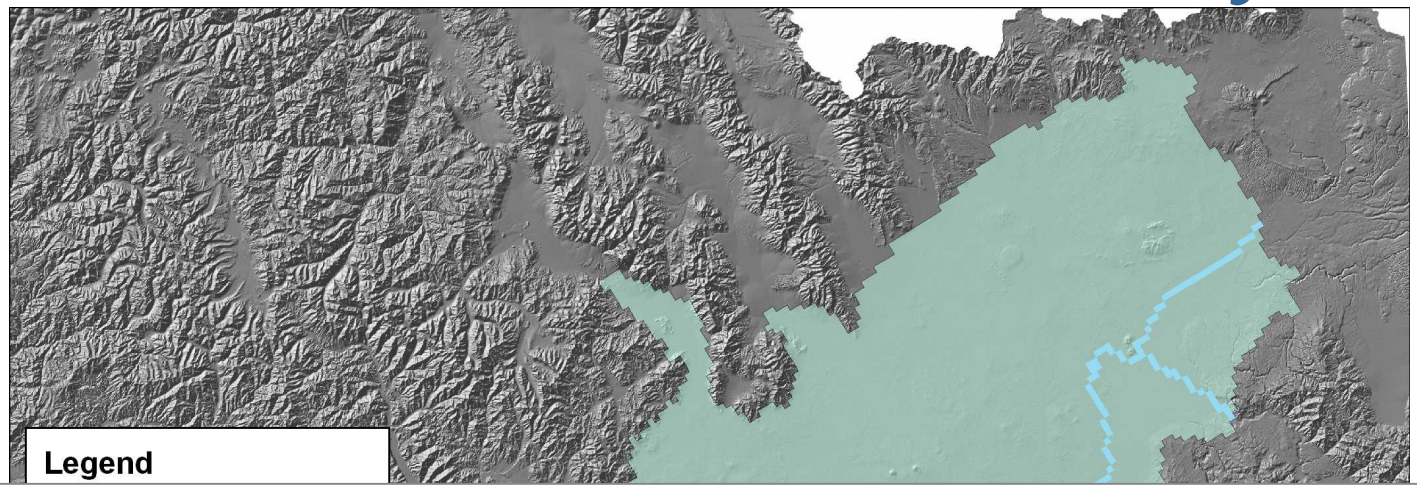


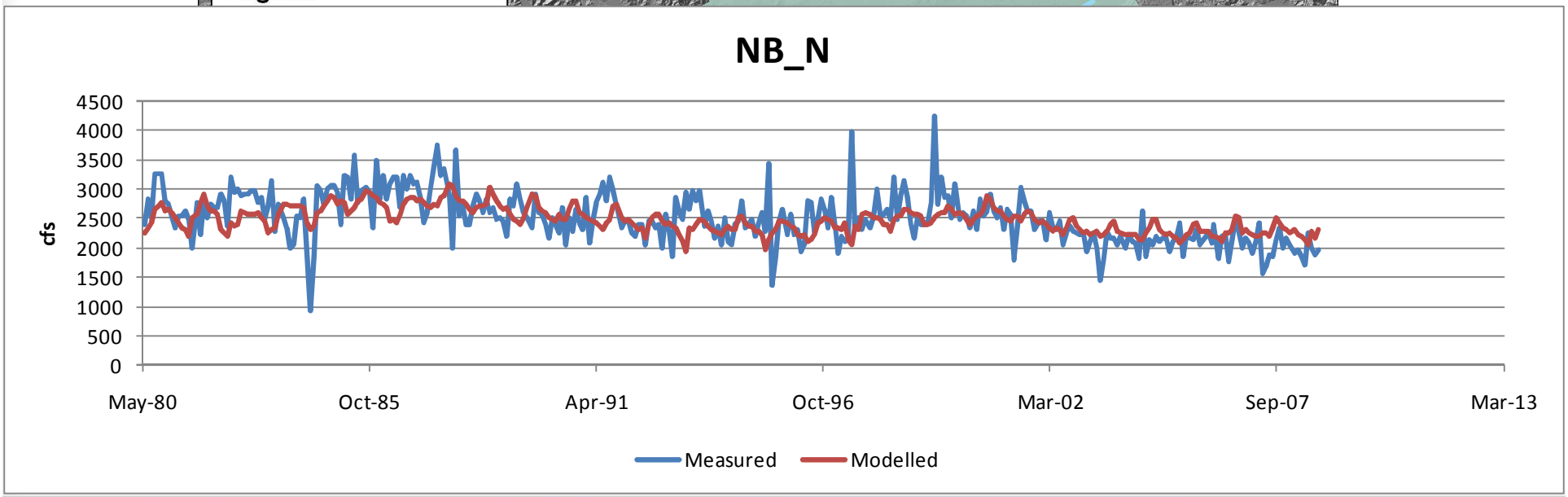
Shelley – nr Blackfoot



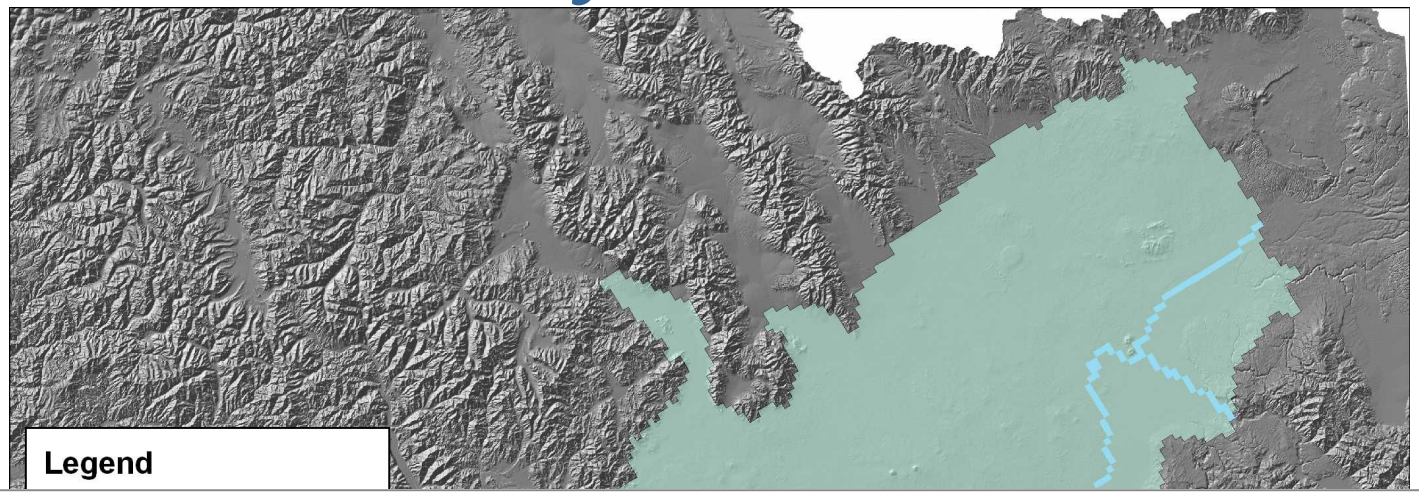


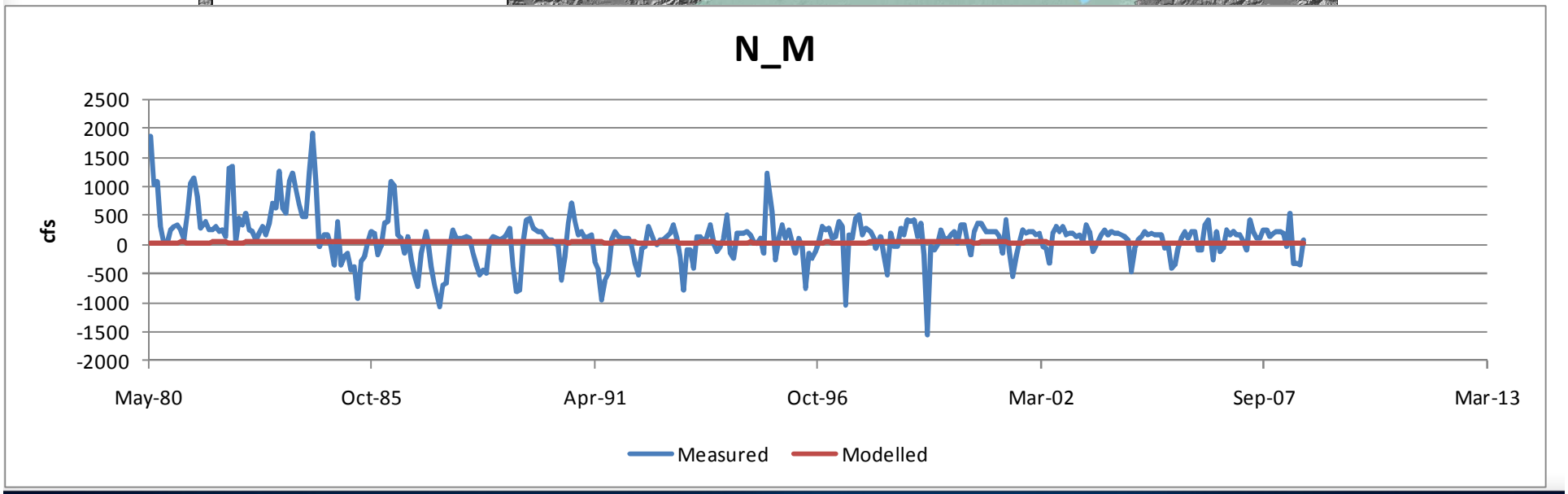
Nr Blackfoot - Neeley



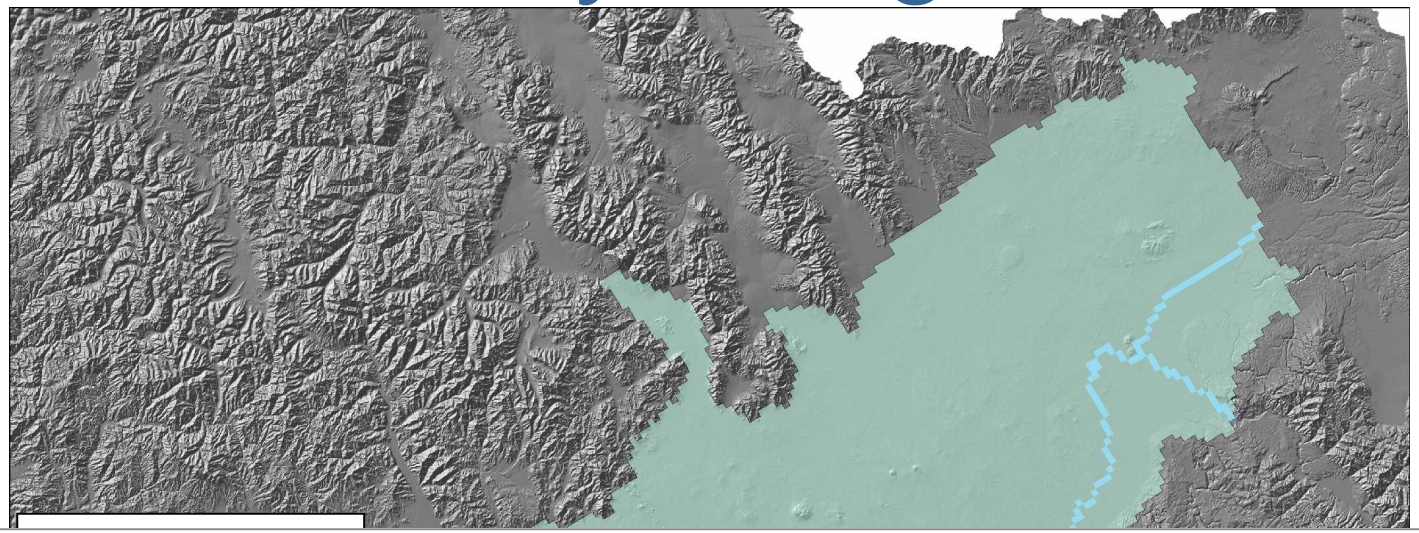


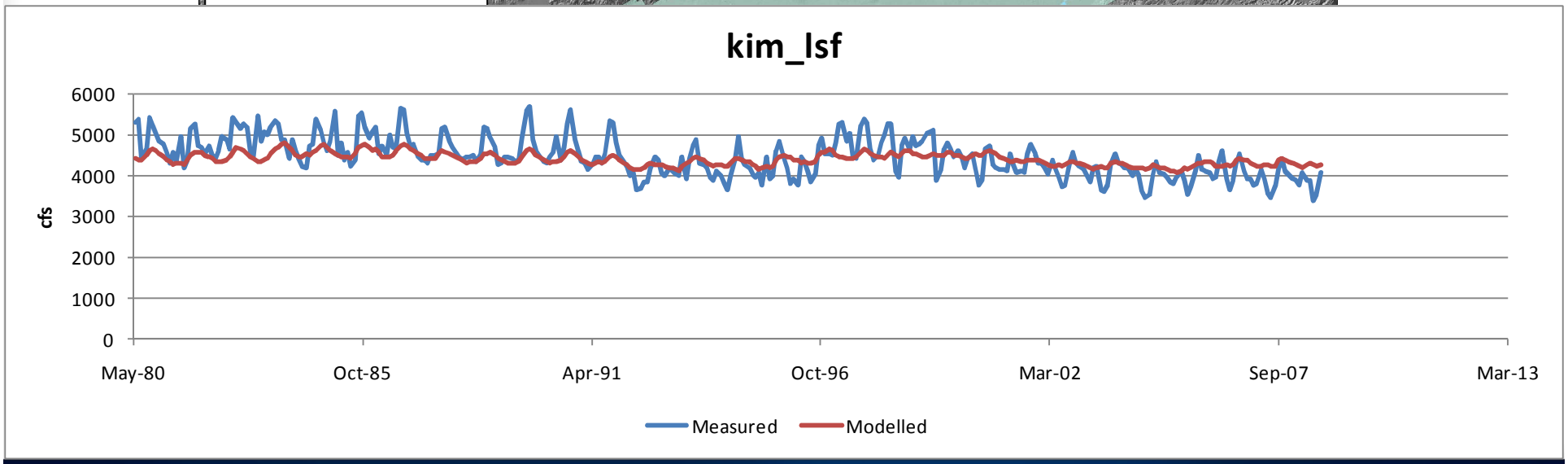
Neeley - Minidoka





Kimberly - Hagerman





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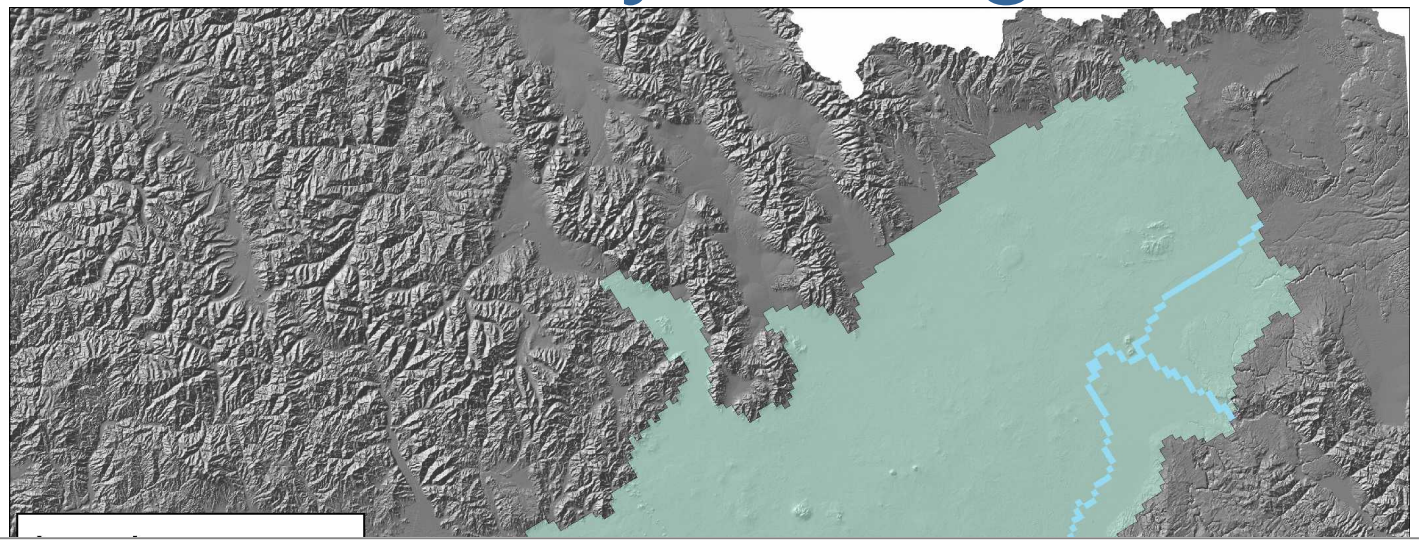
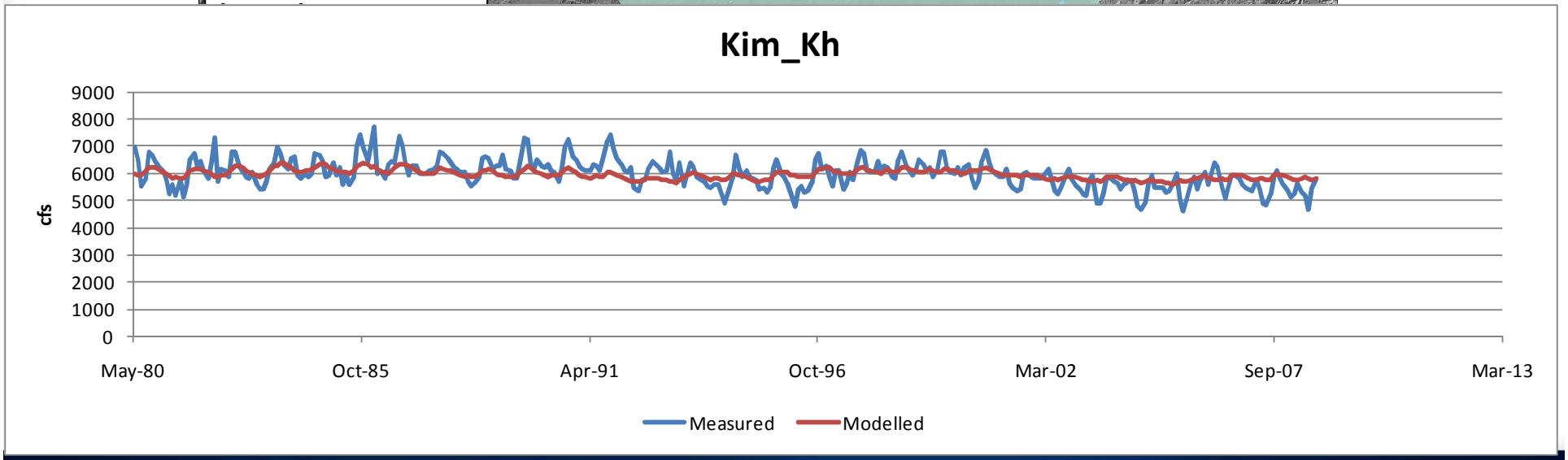
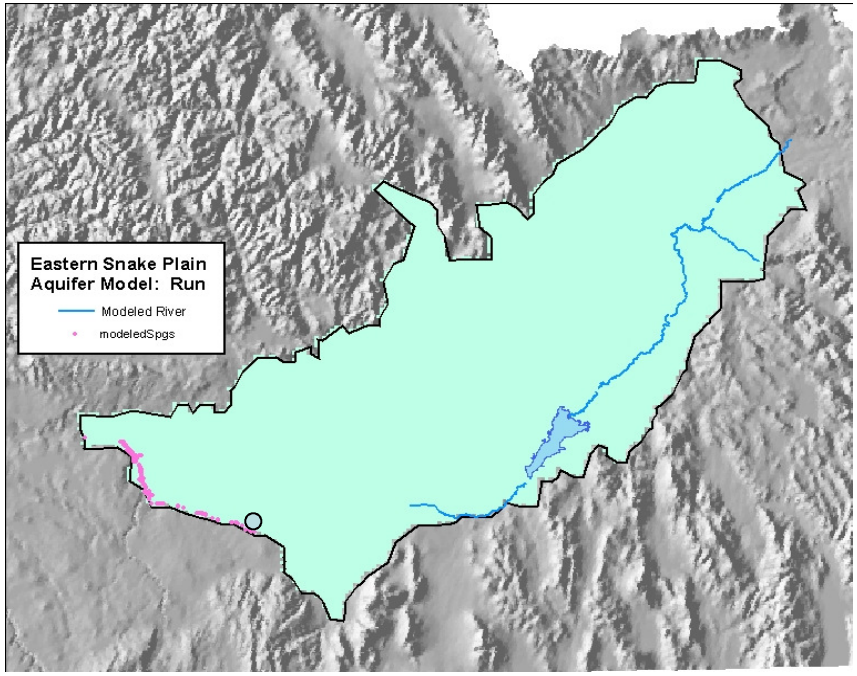
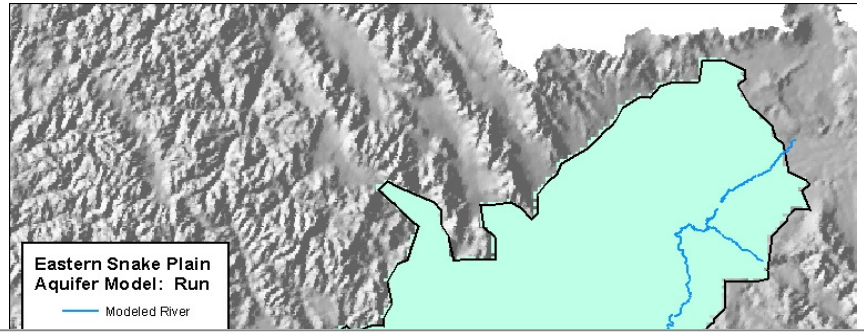


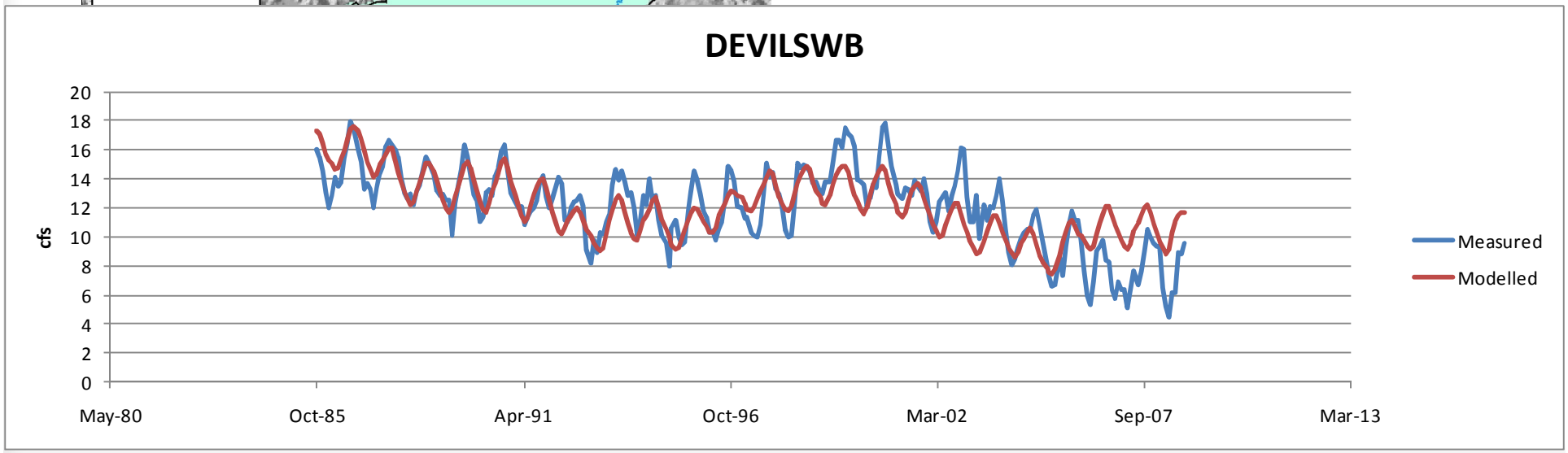


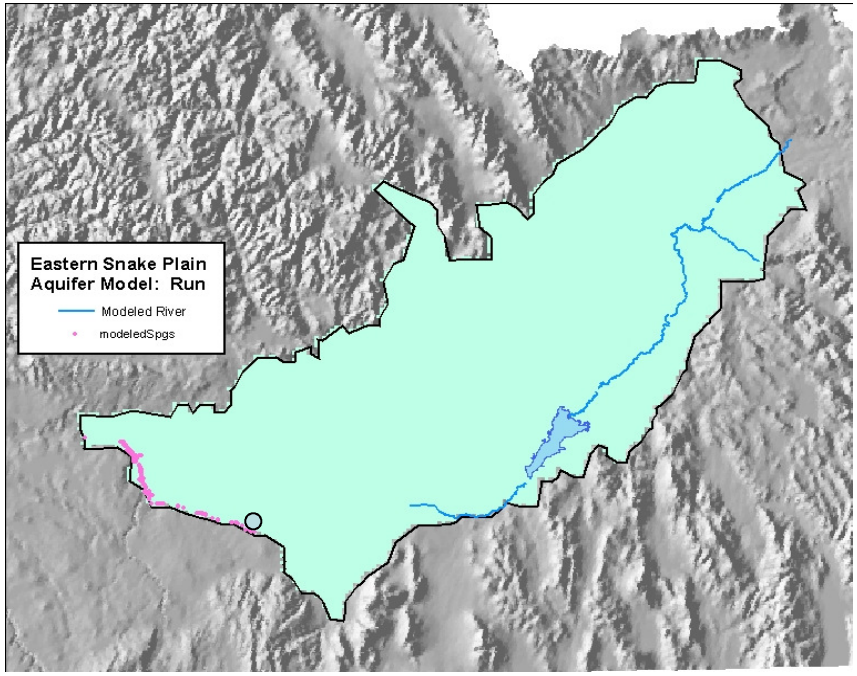


- Devils Washbowl

- Devils Washbowl

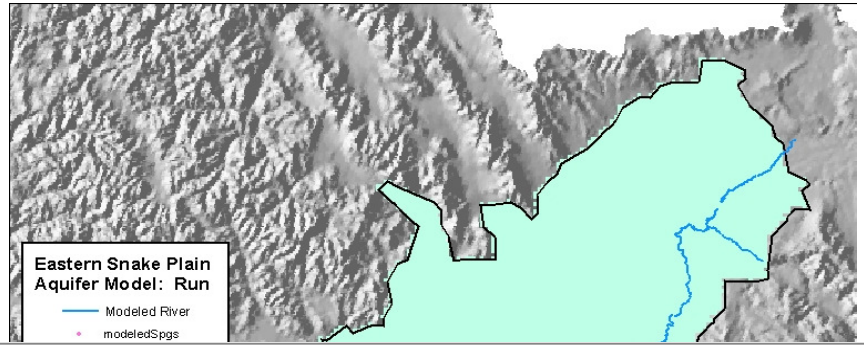


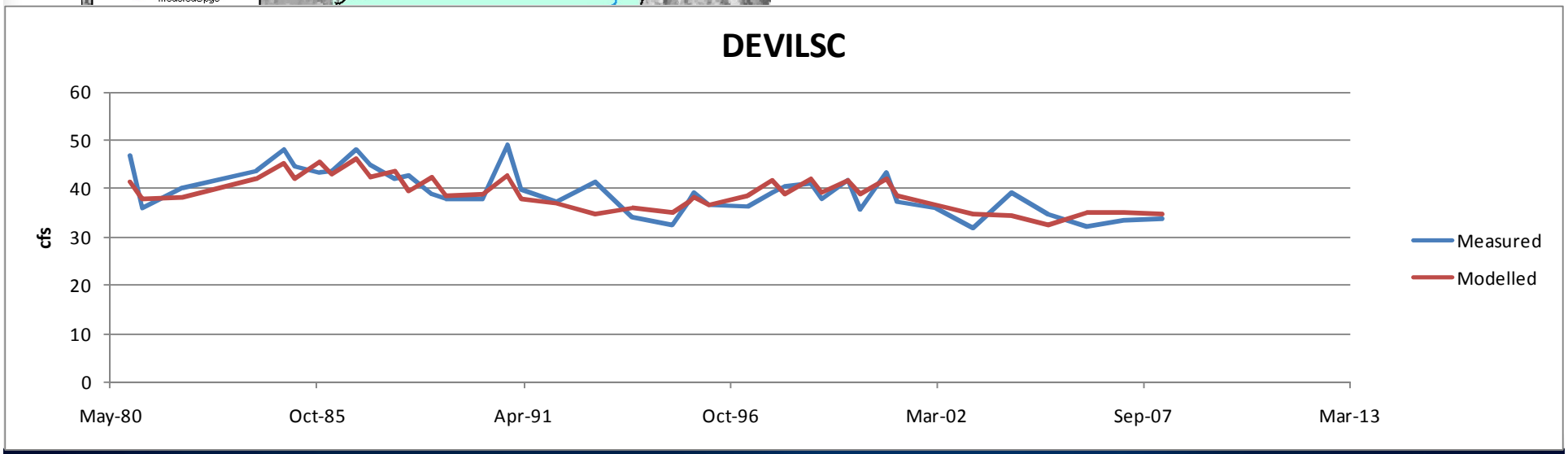


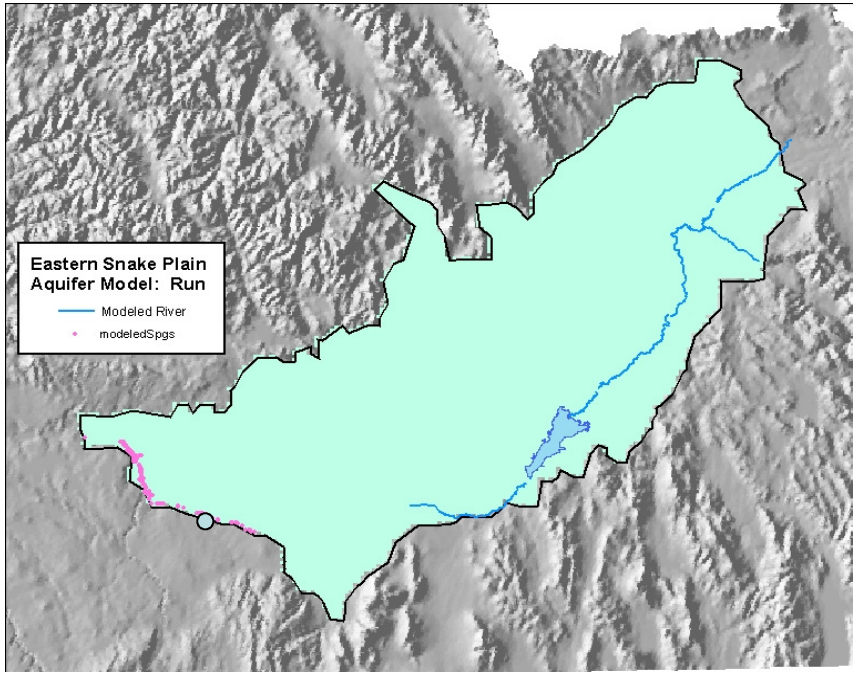


- Devils Corral

- Devils Corral

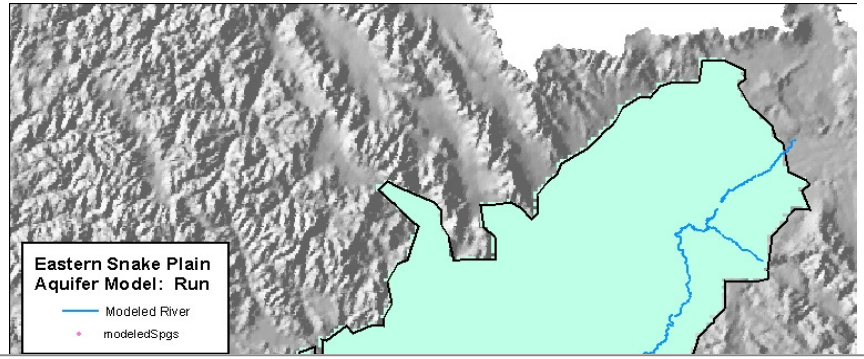


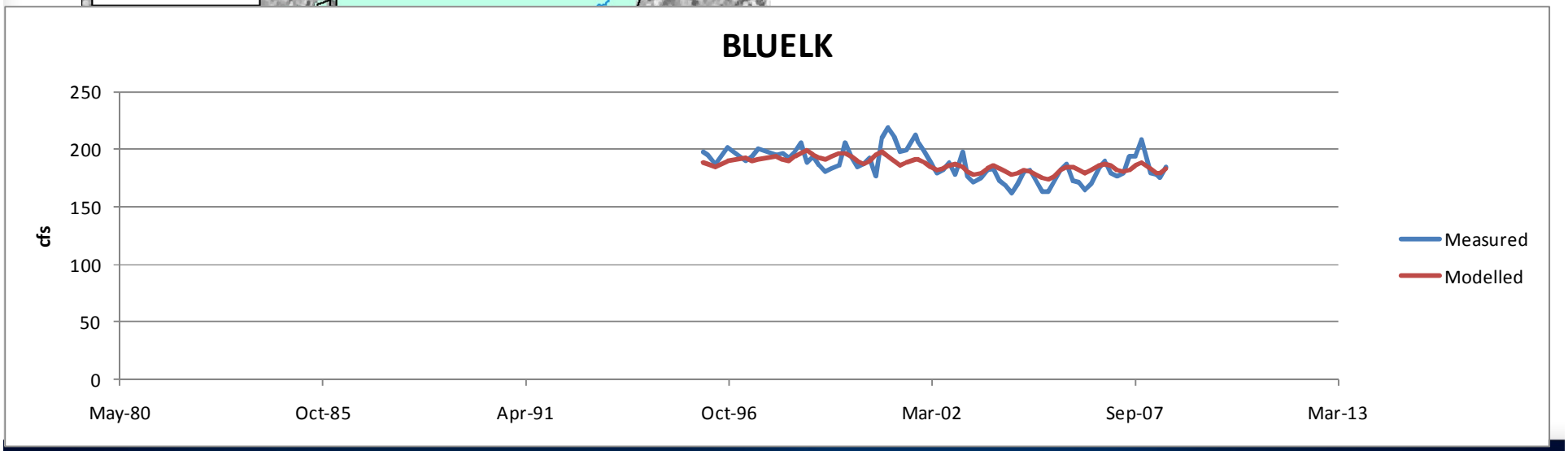


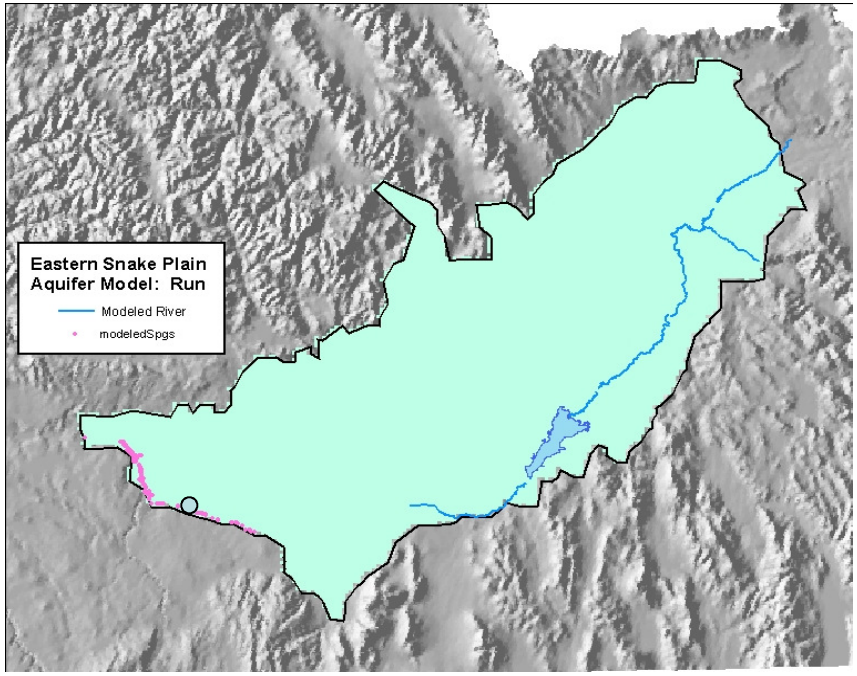

Eastern Snake Plain
Aquifer Model: Run
Modeled River
modeledSpgs

- Blue Lakes

- Blue Lakes

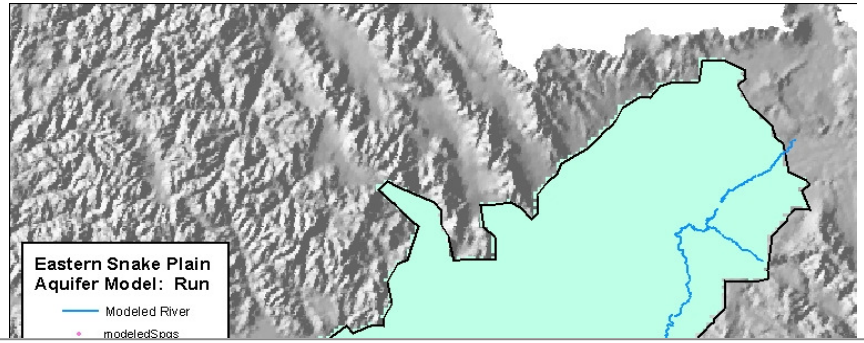

Eastern Snake Plain
Aquifer Model: Run
Modeled River
modeledSpgs

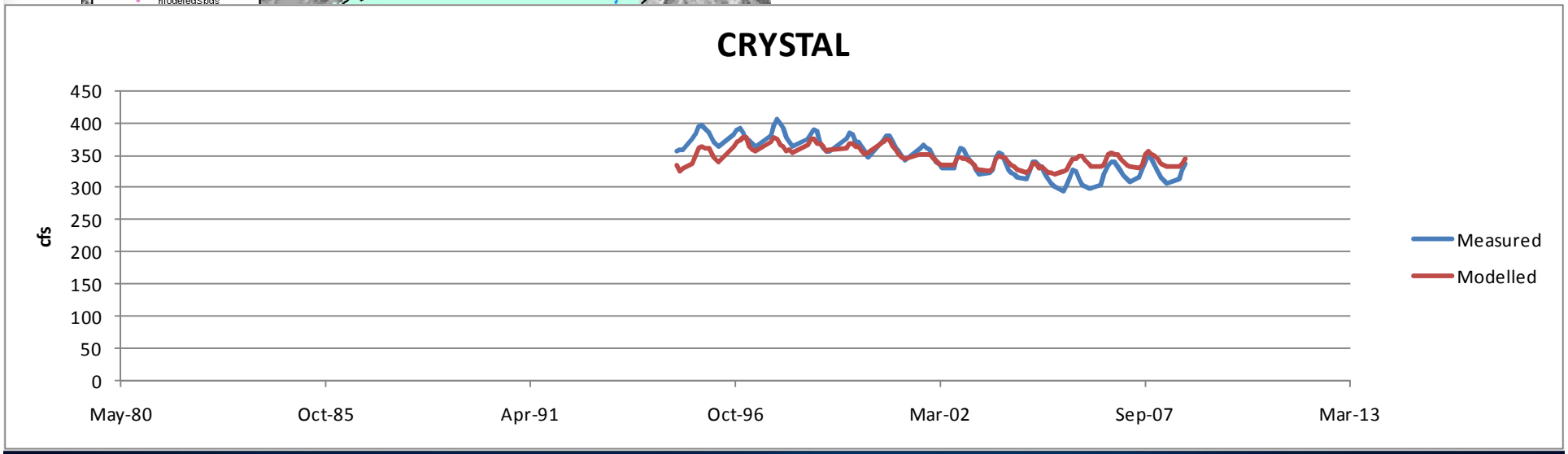

BLUELK
250
200
150
100
50
0
cfs
May-80
Oct-85
Apr-91
Oct-96
Mar-02
Sep-07
Mar-13
Measured
Modelled

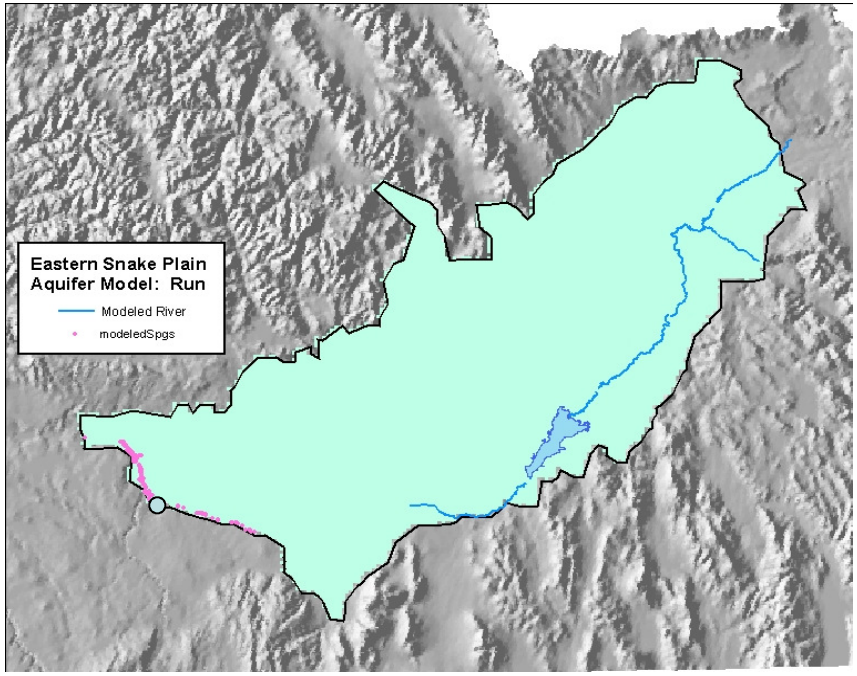


- Crystal Springs

- Crystal Springs

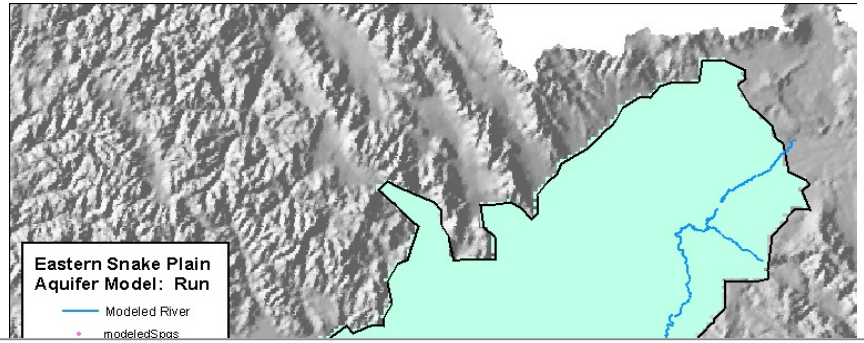


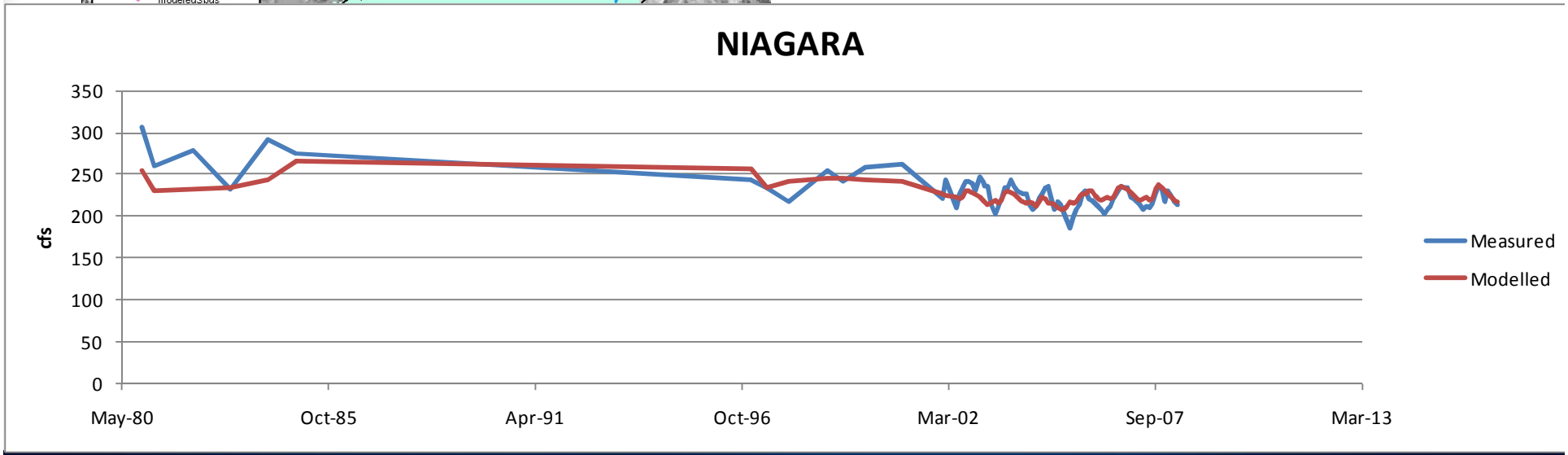



Eastern Snake Plain
Aquifer Model: Run
Modeled River
modeledSpgs

- Niagara

- Niagara


Eastern Snake Plain
Aquifer Model: Run
Modeled River
modeledSpgs


NIAGARA
cfs
350
300
250
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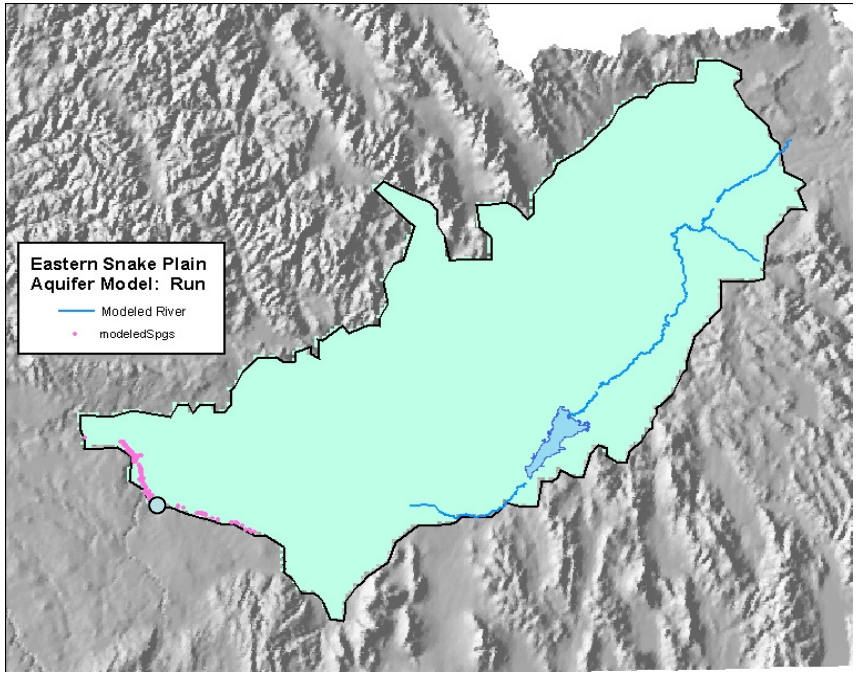
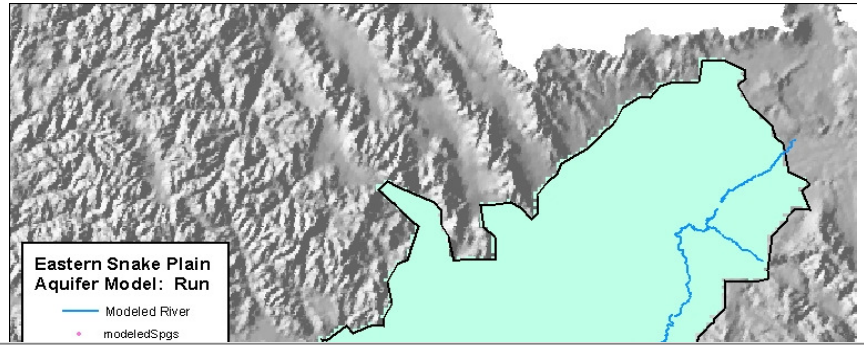
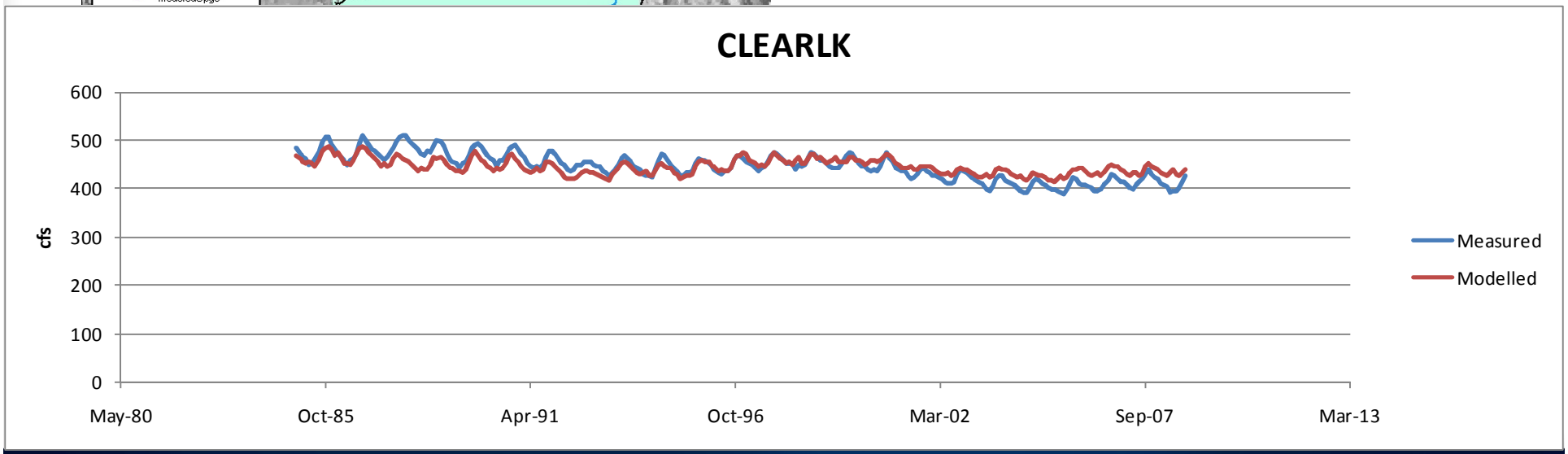
50
0
May-80
Oct-85
Apr-91
Oct-96
Mar-02
Sep-07
Mar-13
Measured
Modelled


Eastern Snake Plain
Aquifer Model: Run
Modeled River
modeledSpgs

- Clear Lakes

- Clear Lakes


Eastern Snake Plain
Aquifer Model: Run
Modeled River
modeledSpgs


CLEARLK
600
500
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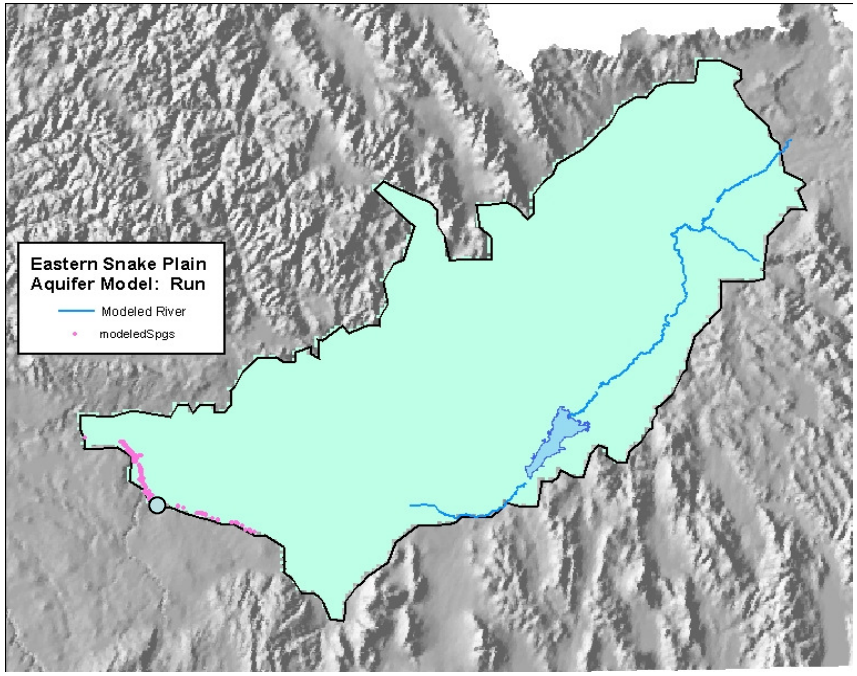
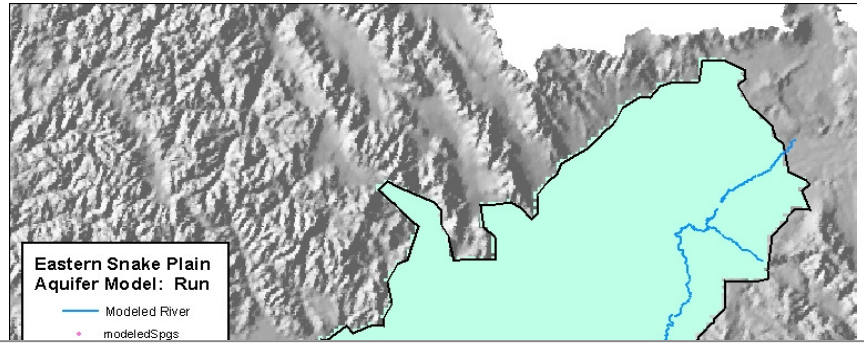
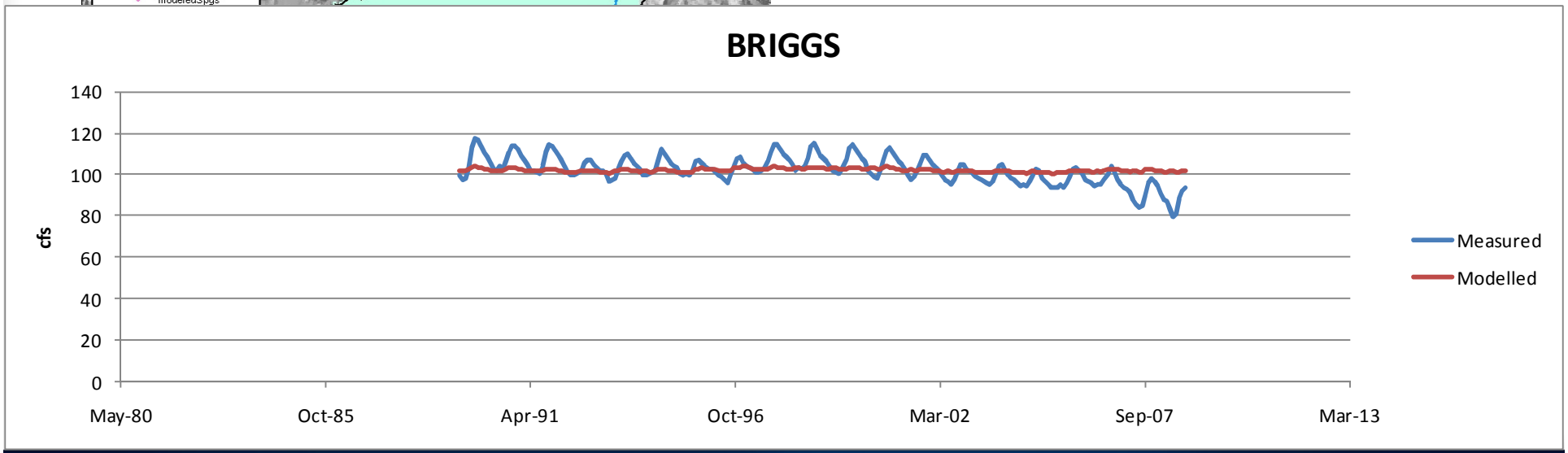
Mar-13
Measured
Modelled

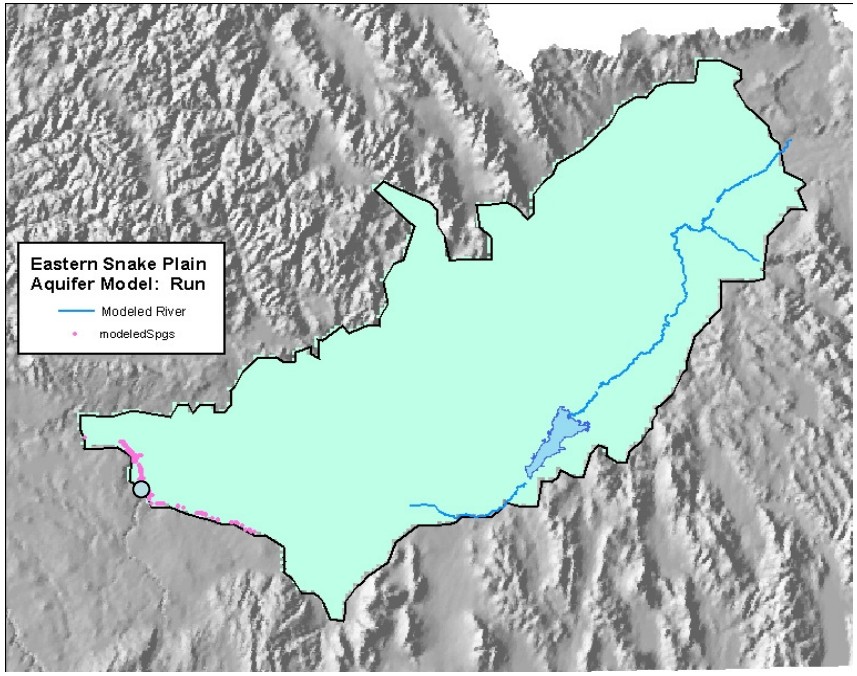


- Briggs Spring

- Briggs Spring

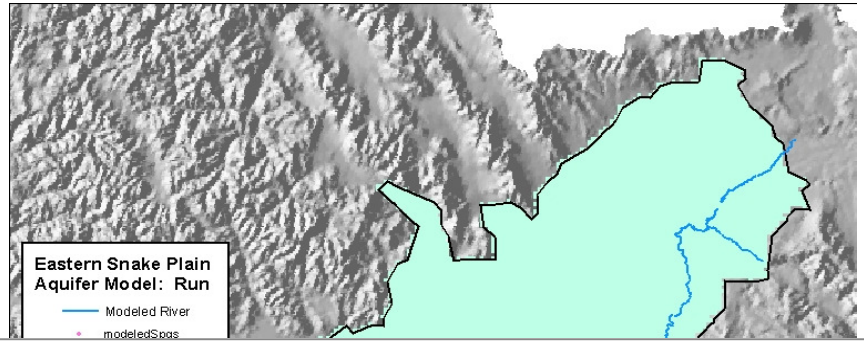


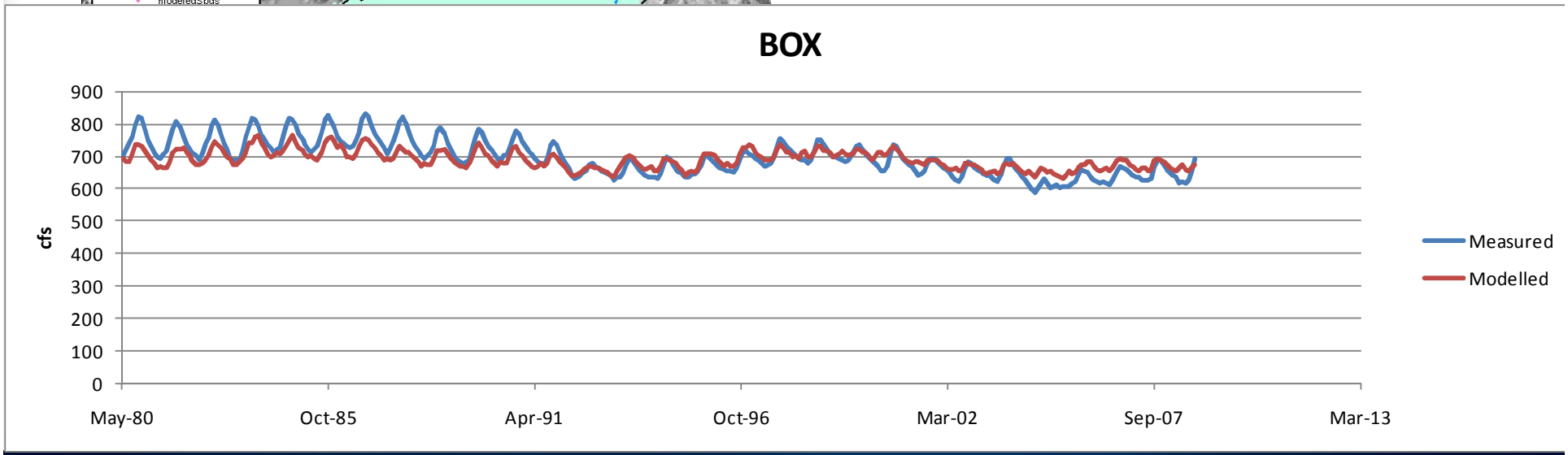


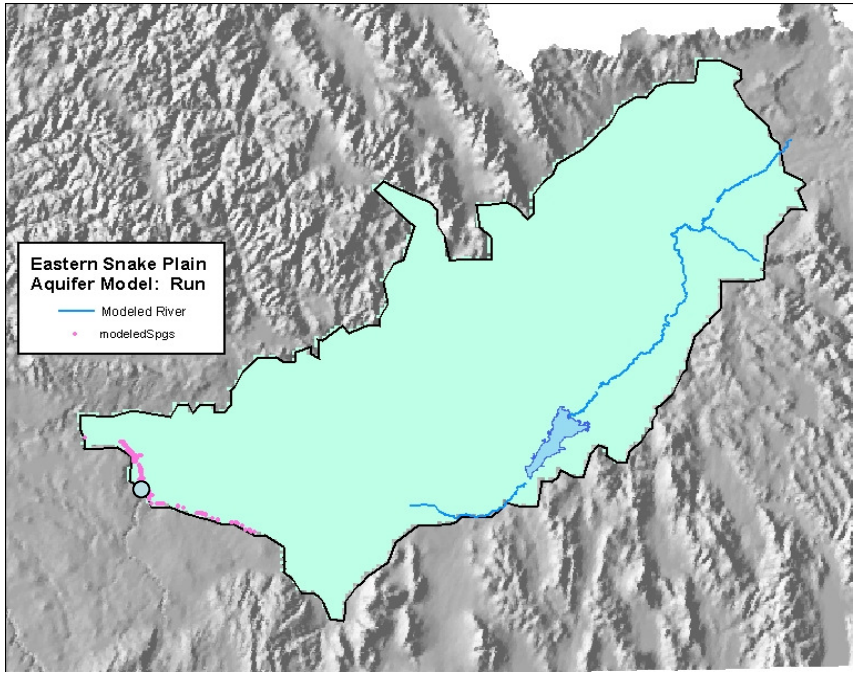


- Box Canyon Spring

- Box Canyon Spring

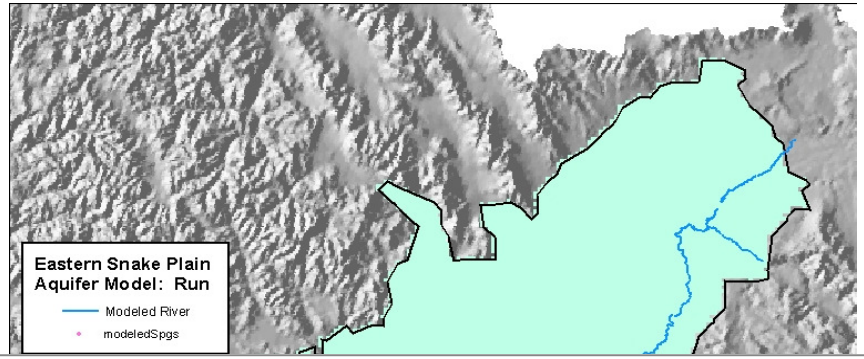


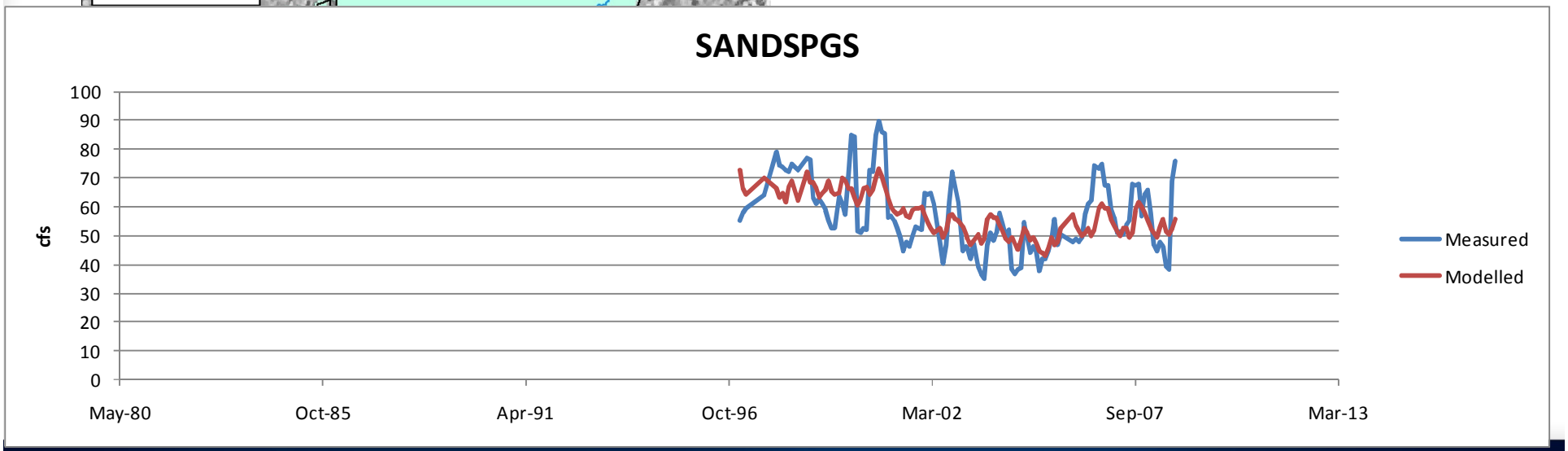


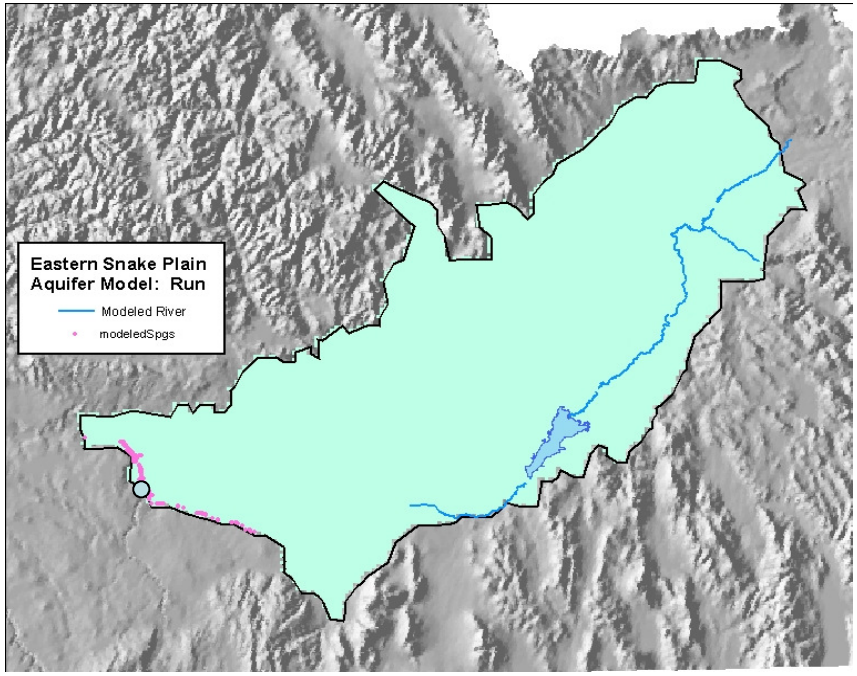


- Sand Springs

- Sand Springs

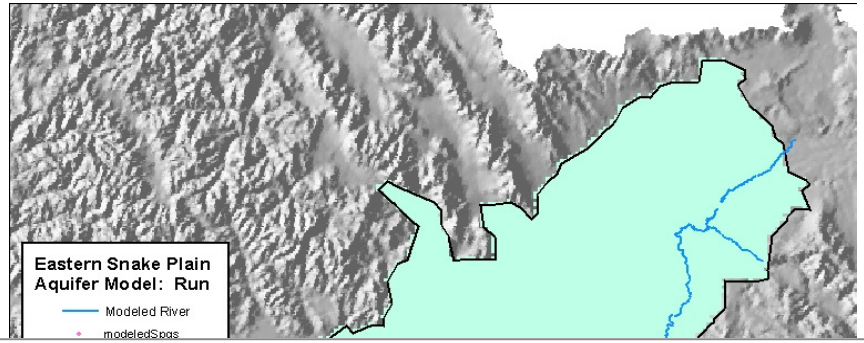


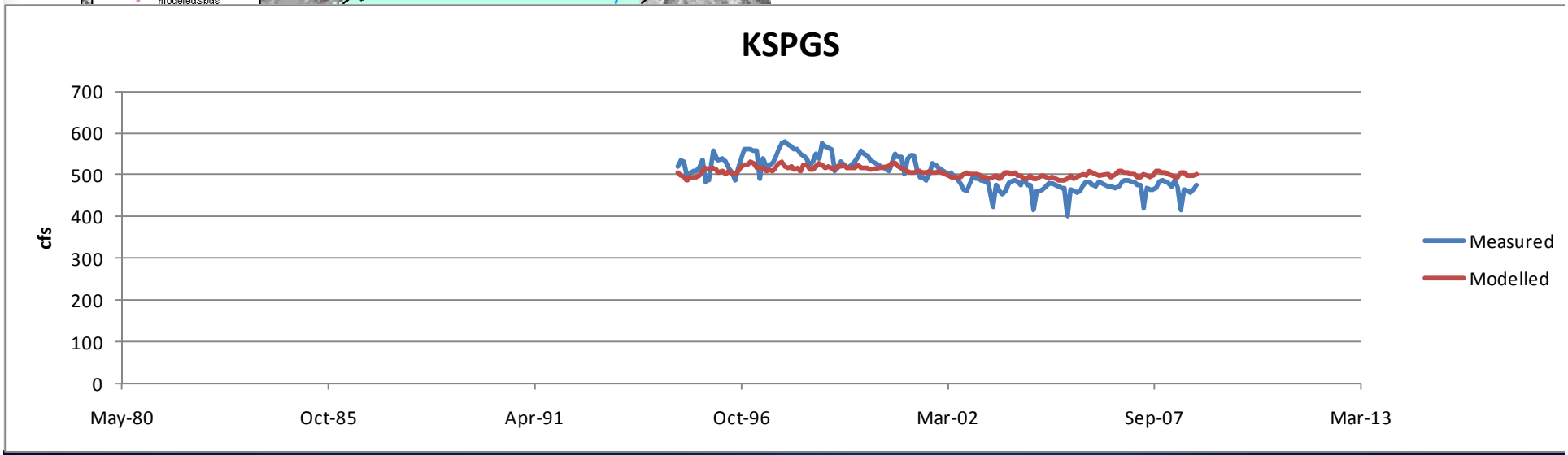


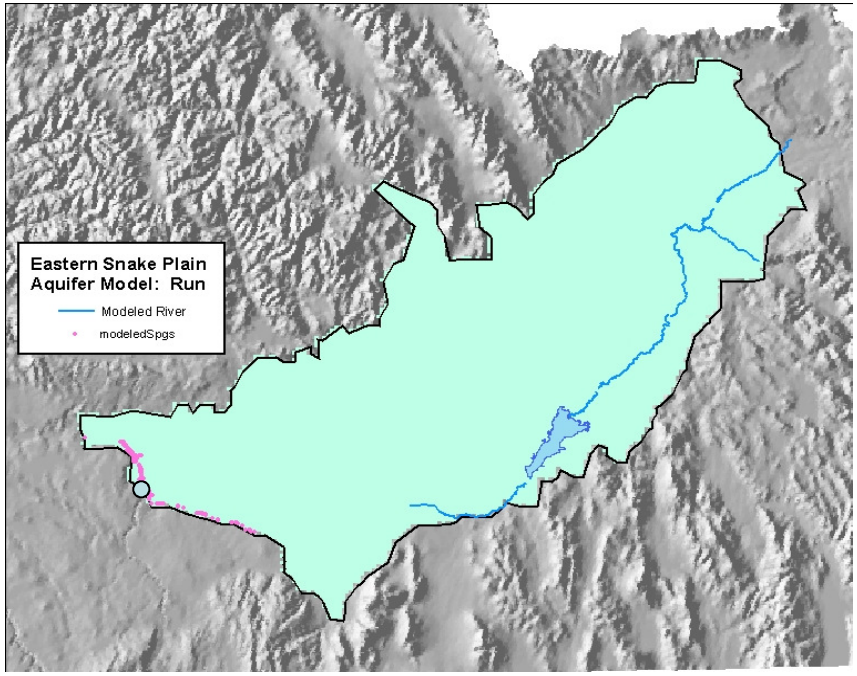


- Thousand Springs

- Thousand Springs

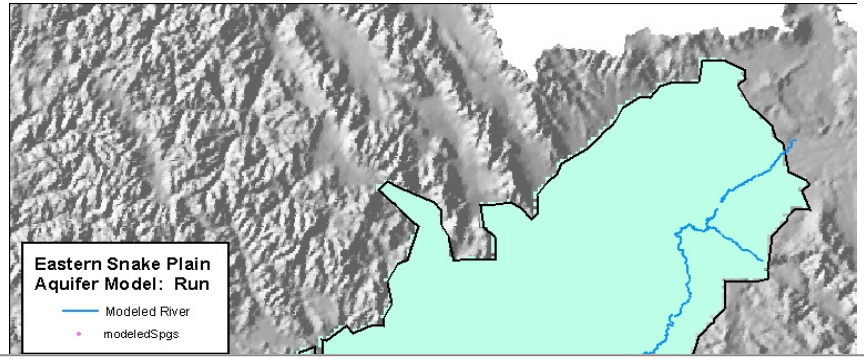


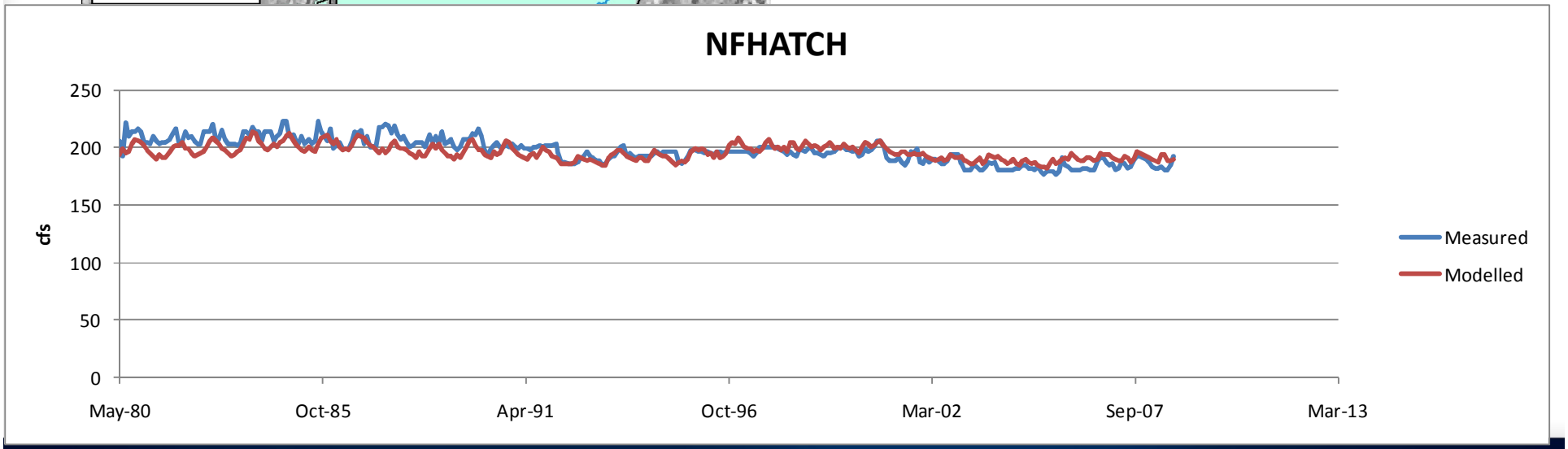


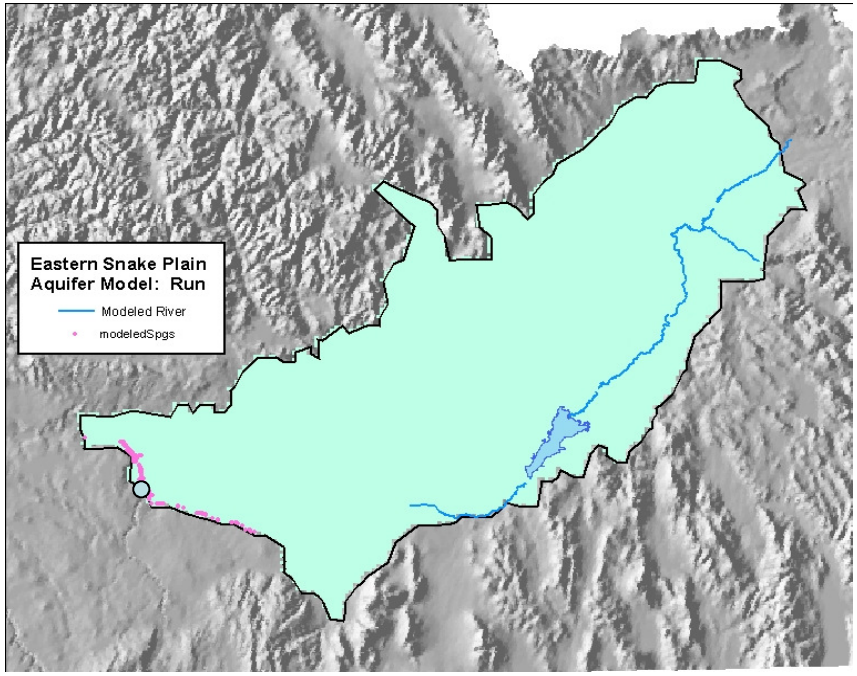


- Ntl Fish Hatchery

- Ntl Fish Hatchery

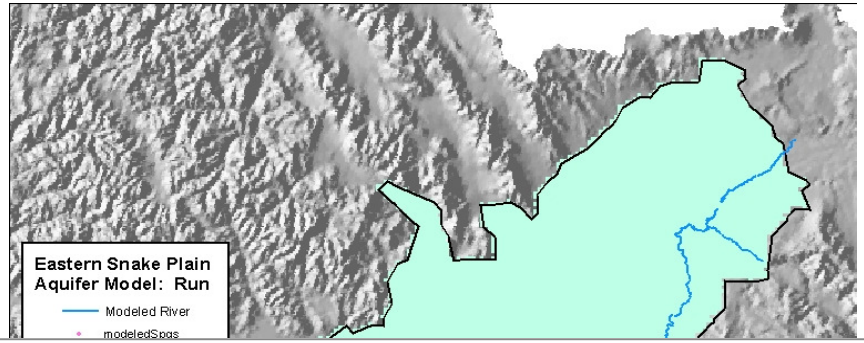


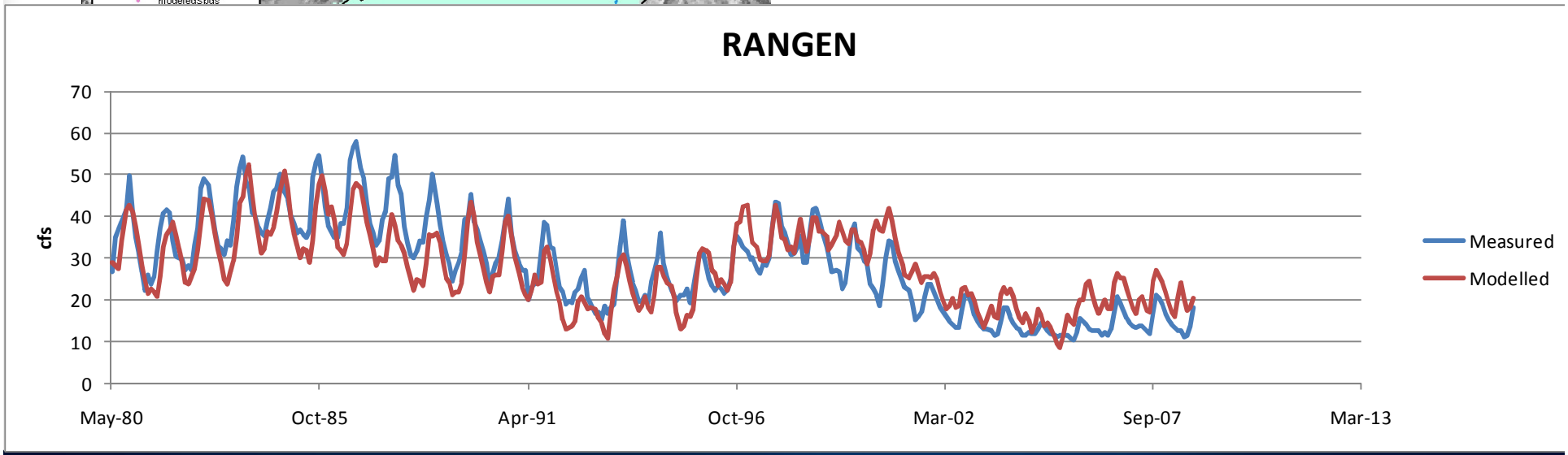


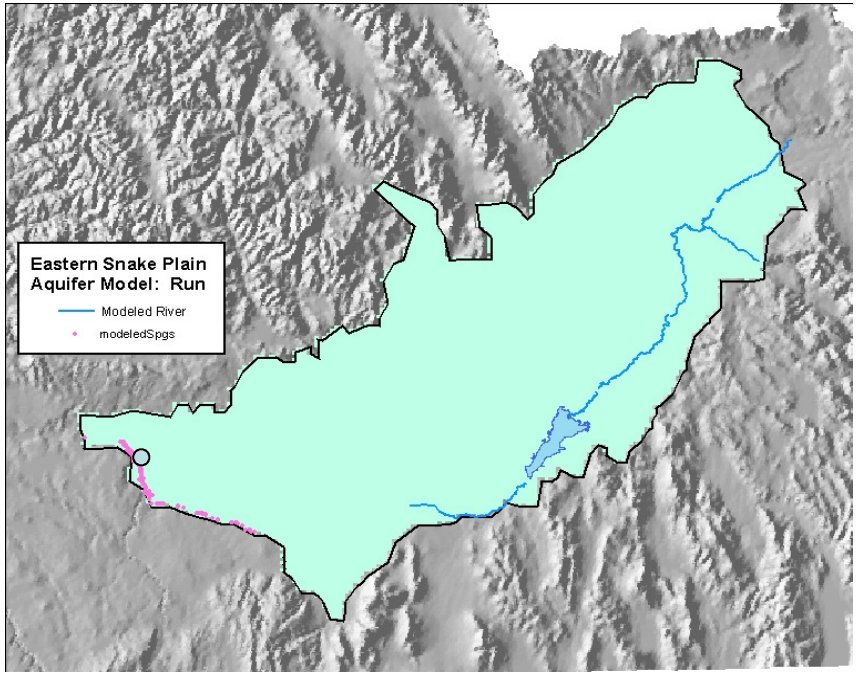


- Rangen Spring

- Rangen Spring

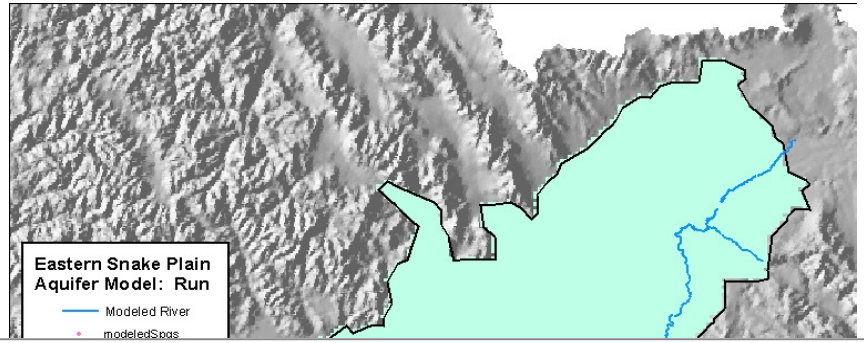


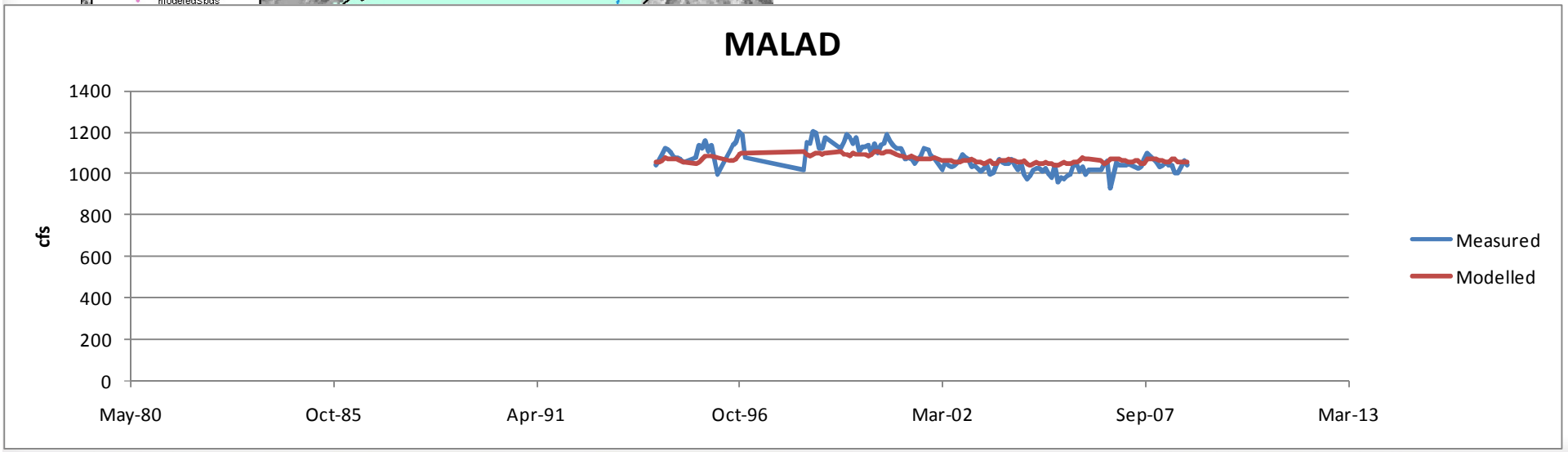



Eastern Snake Plain
Aquifer Model: Run
Modeled River
modeledSpgs

- Malad

- Malad


Eastern Snake Plain
Aquifer Model: Run
Modeled River
modeledSpgs


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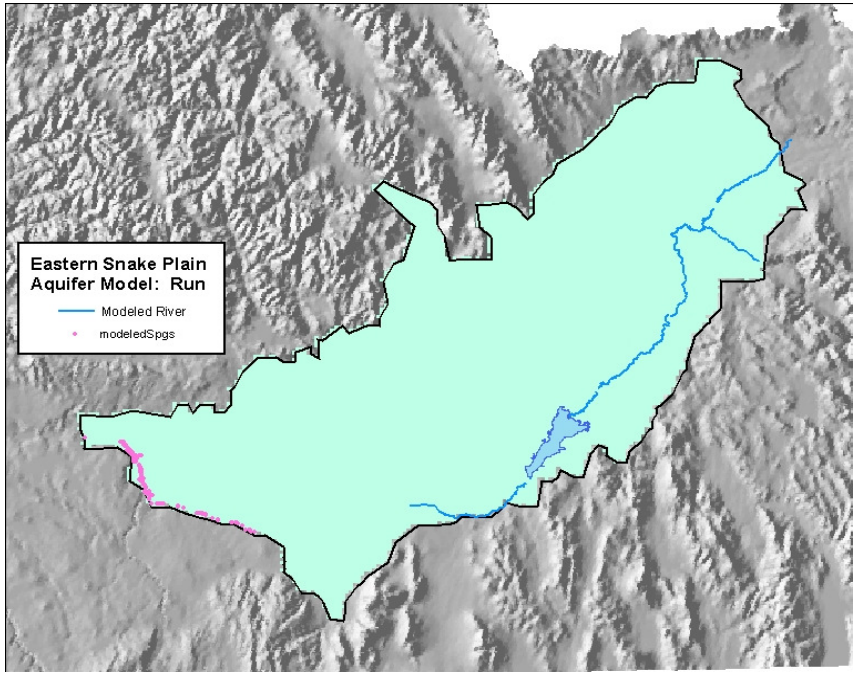
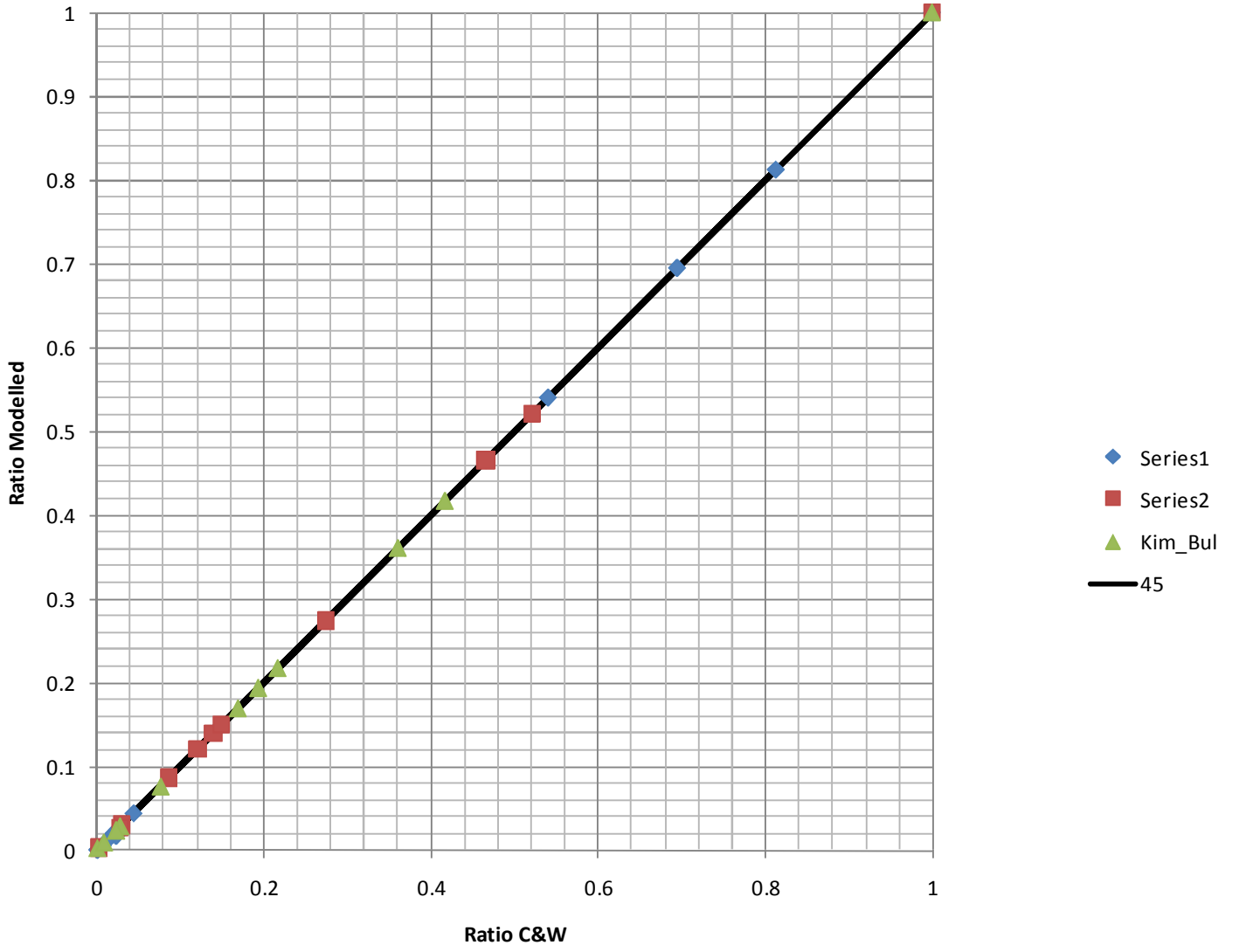
0
cfs
May-80
Oct-85
Apr-91
Oct-96
Mar-02
Sep-07
Mar-13
Measured
Modelled



- Group C Springs

Eastern
Aquifer


Ratio Modelled
Ratio C&W
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0.2
0.3
0.4
0.5
0.6
0.7
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0.4
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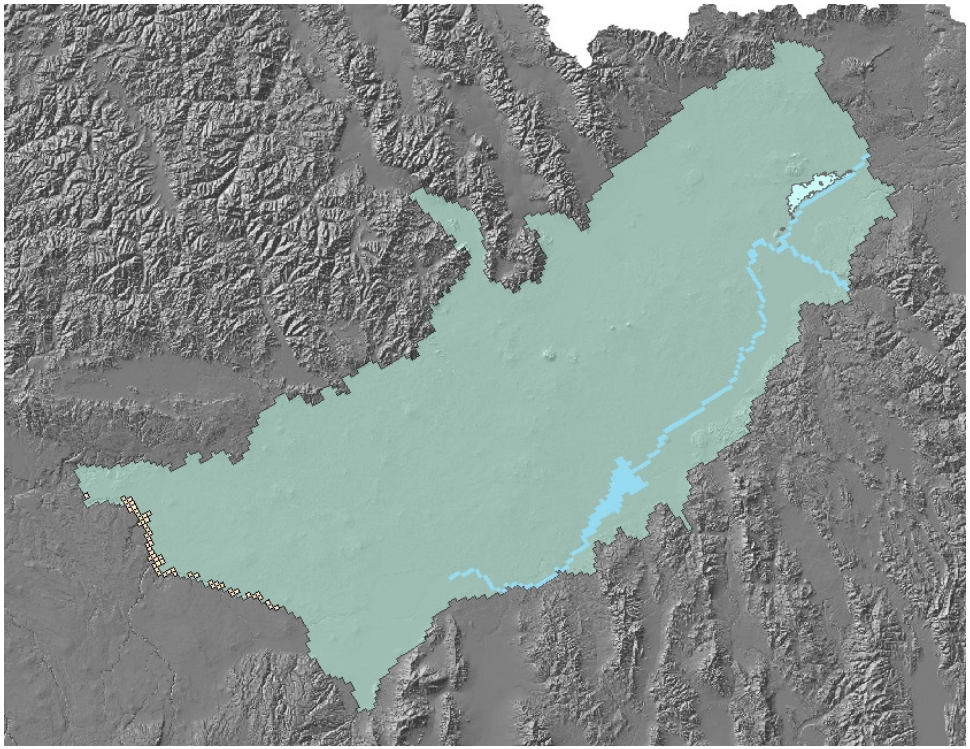
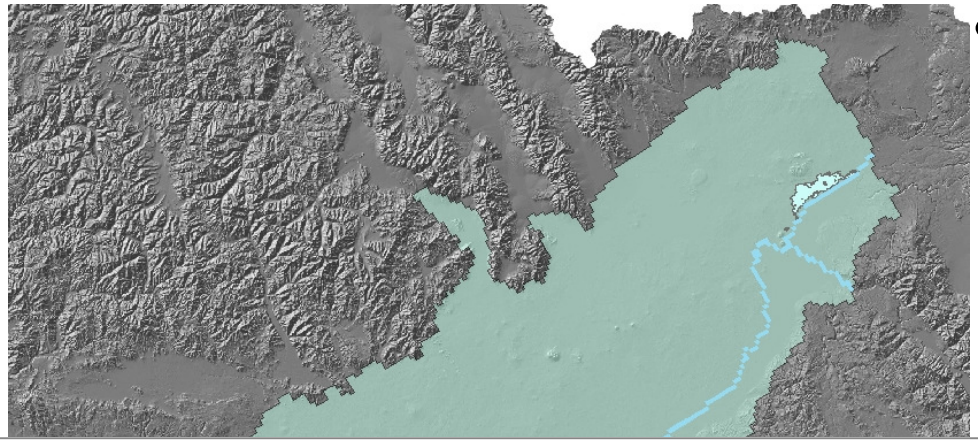
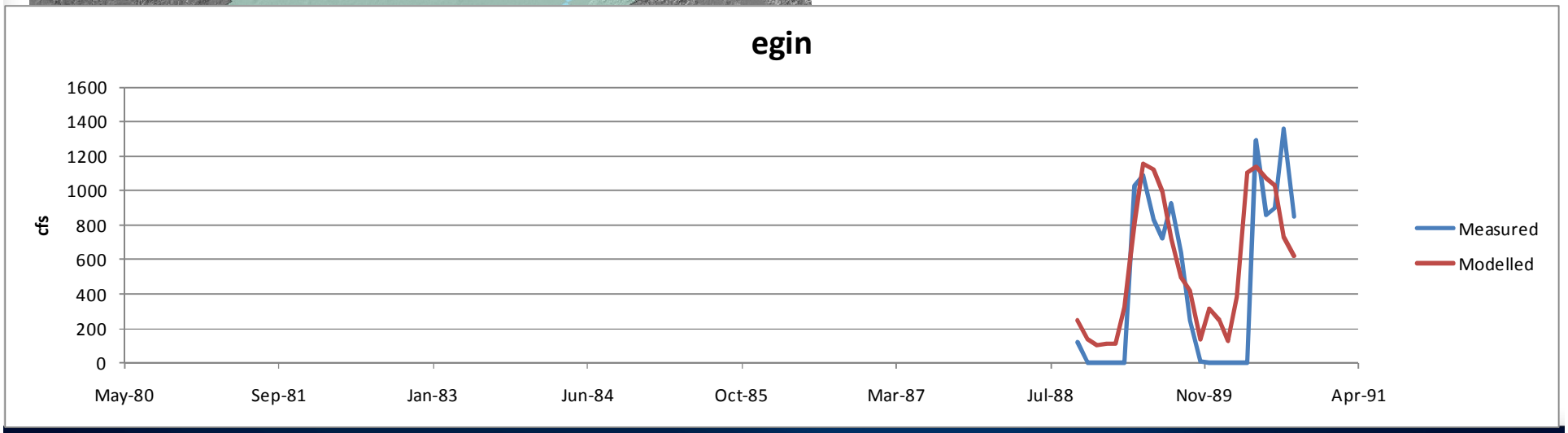
0.8
1
Series1
Series2
Kim_Bul
45

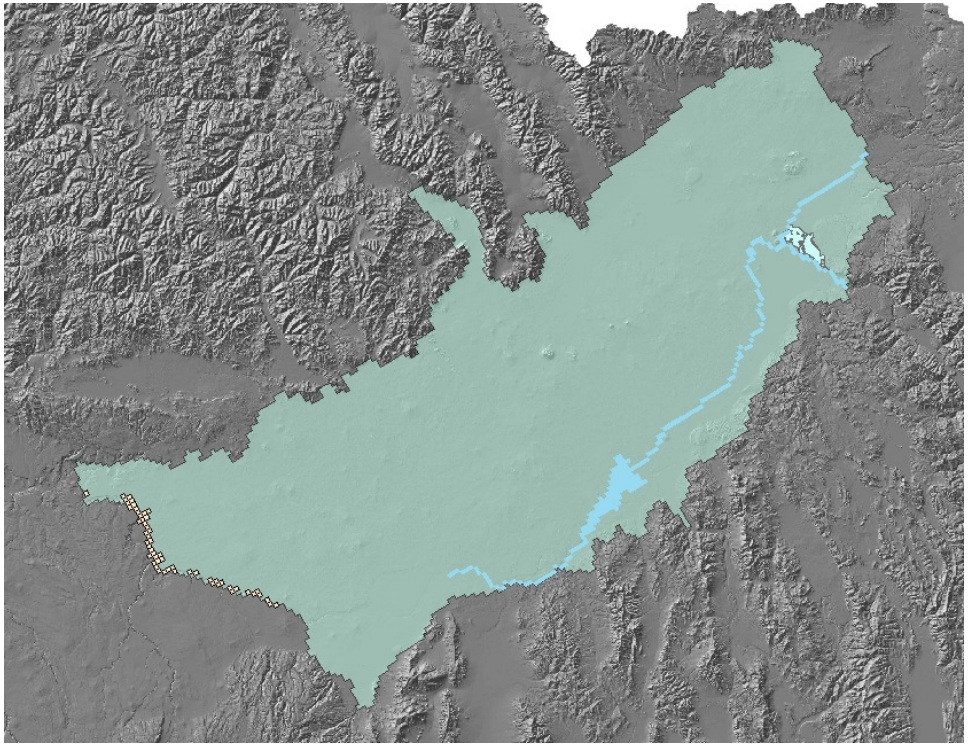


- Egin returns



- Egin returns





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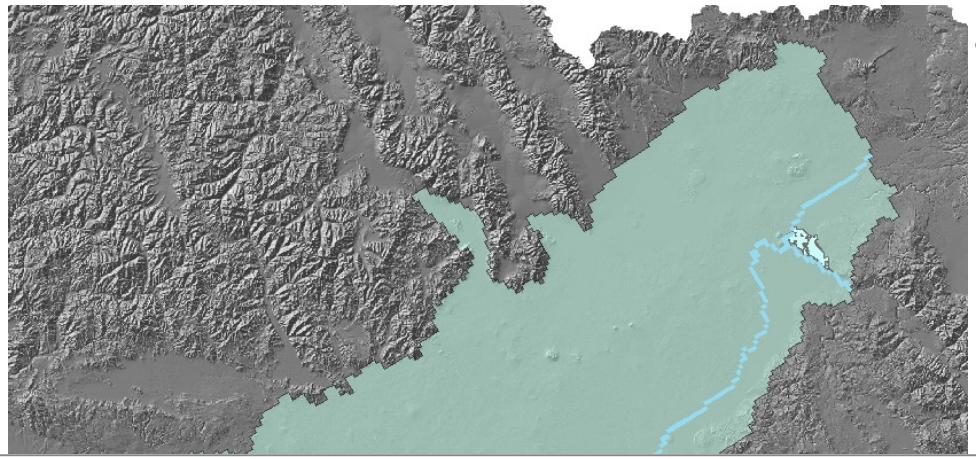
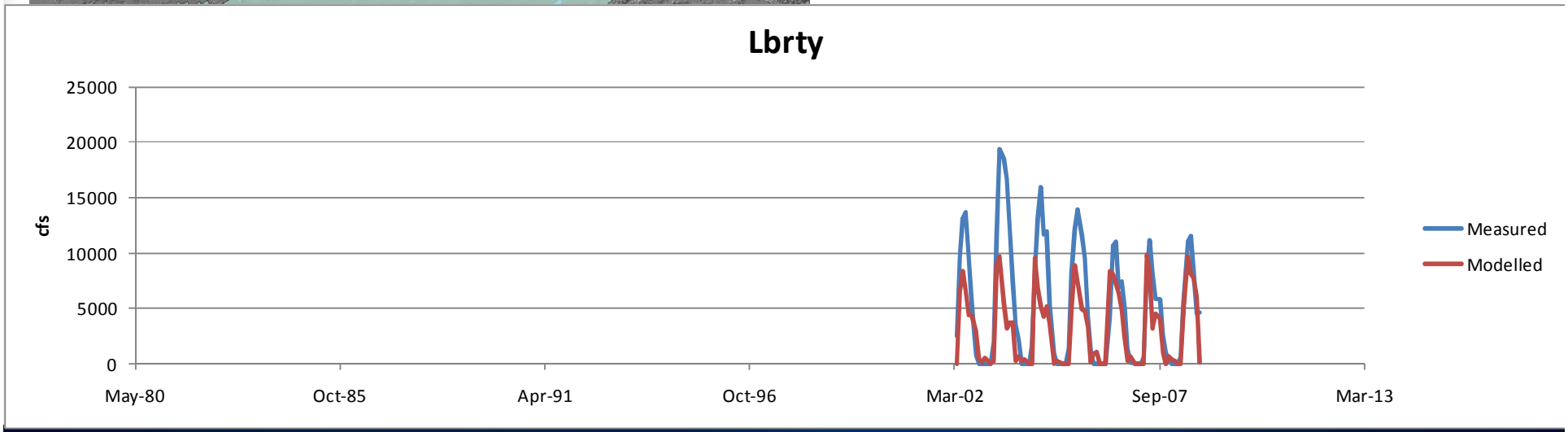
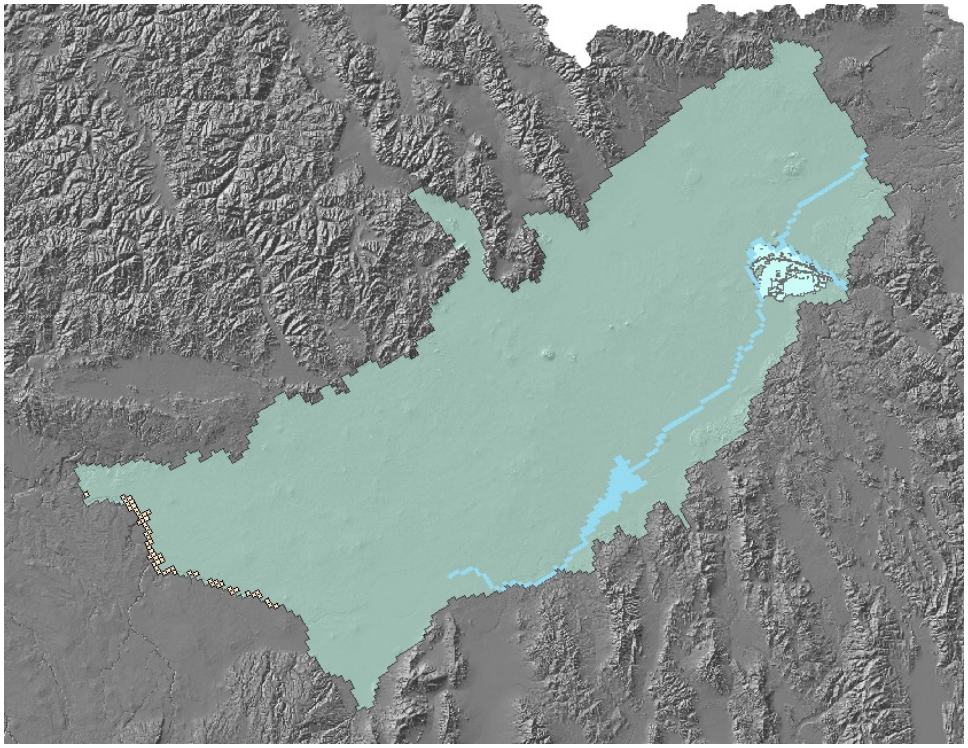


- Liberty returns





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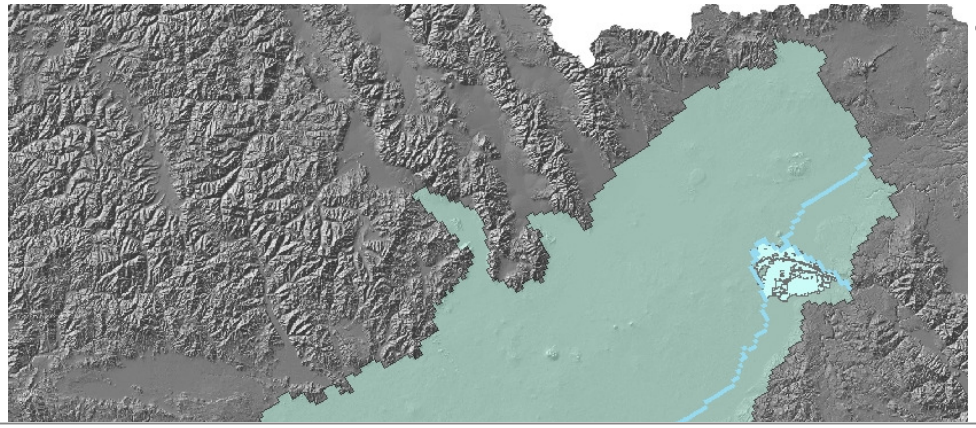
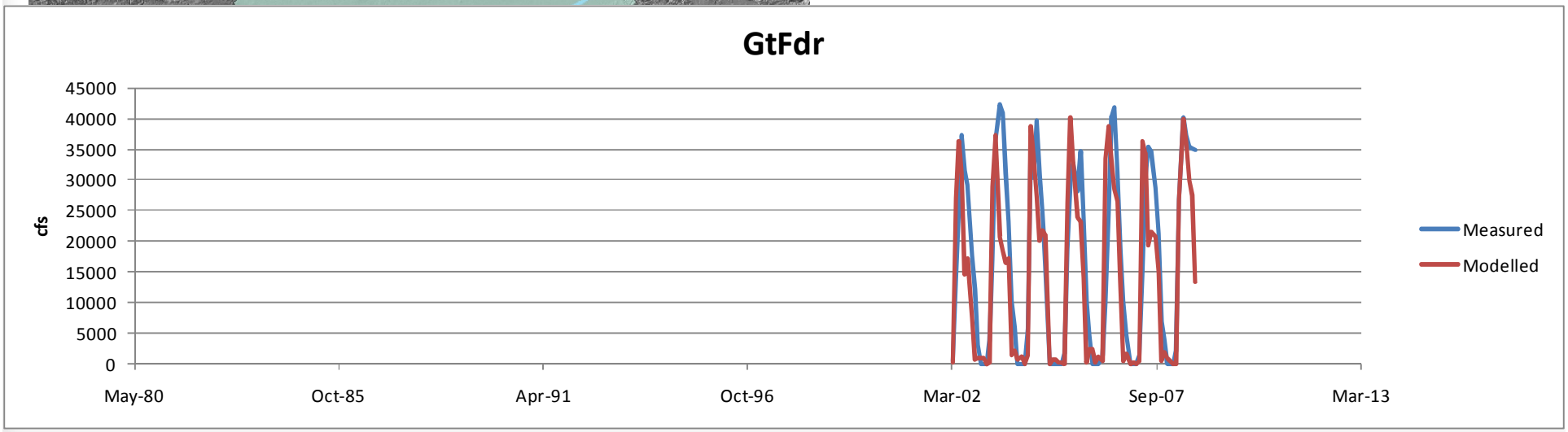
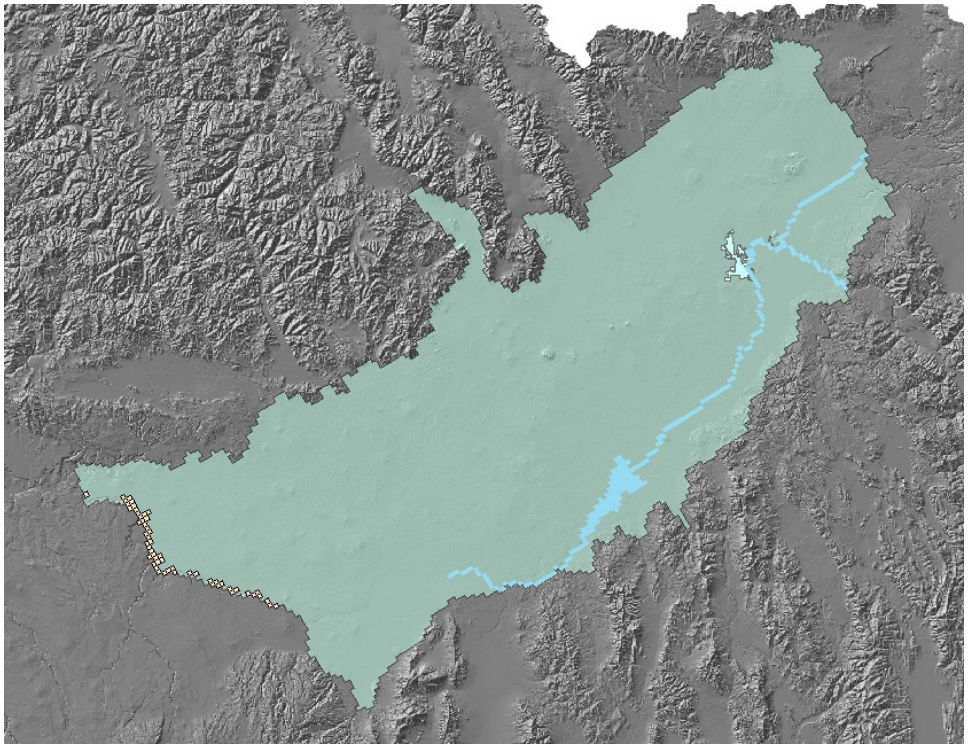
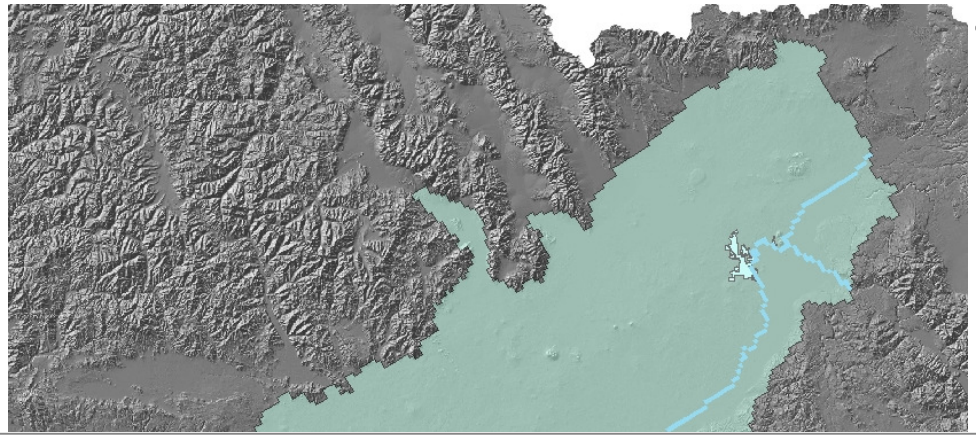


- Great Feeder Group returns

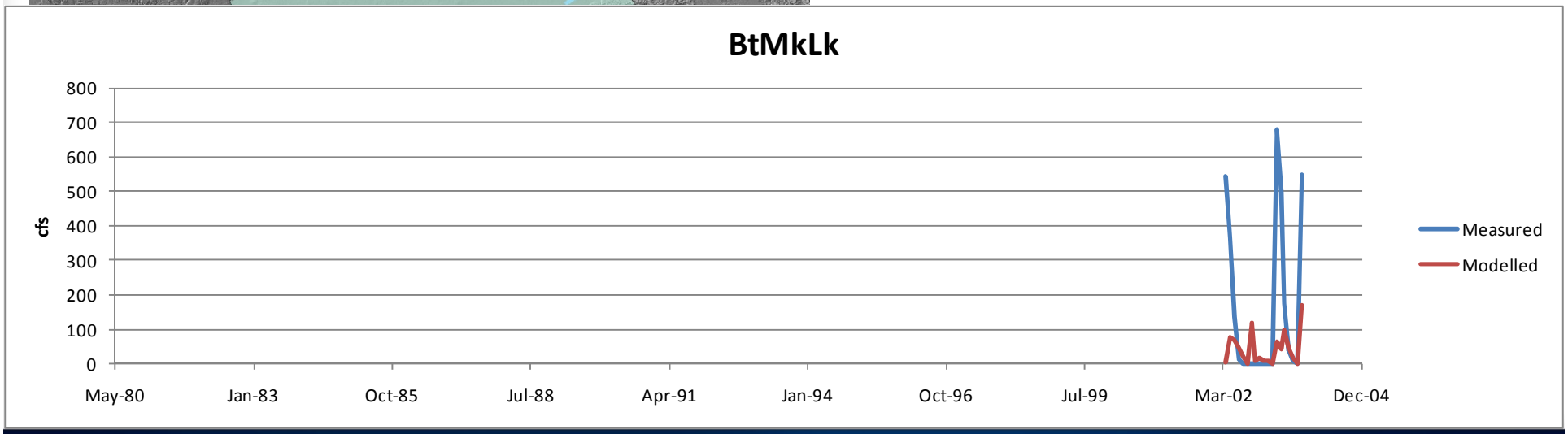


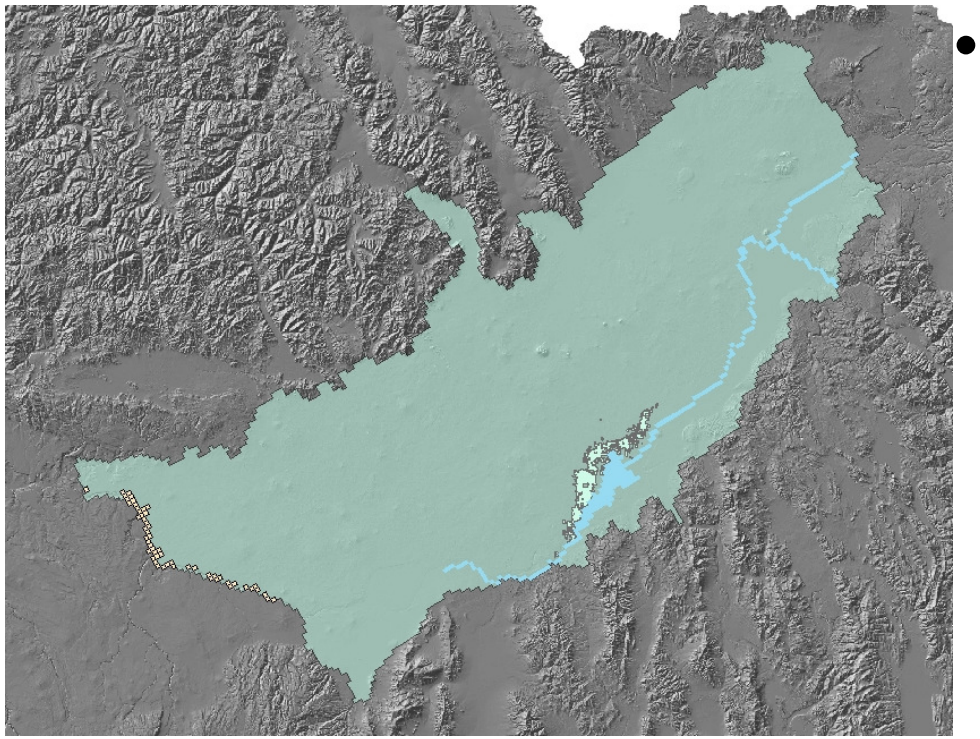


- Butte-Market Lake returns

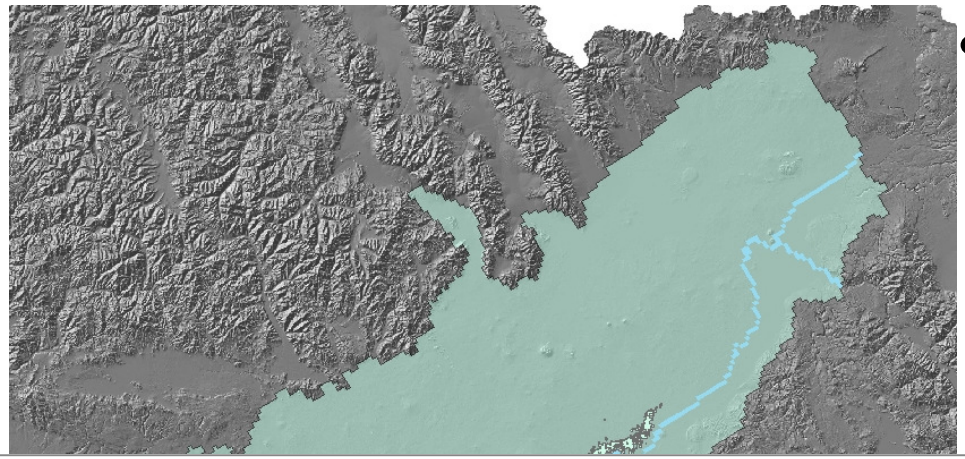


- Butte-Market Lake returns

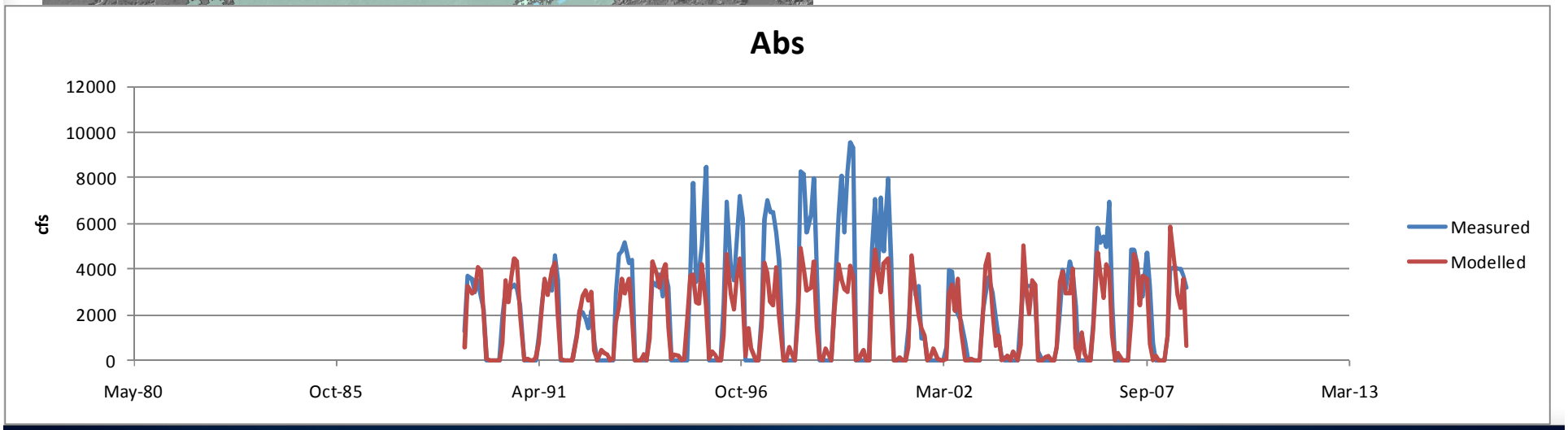


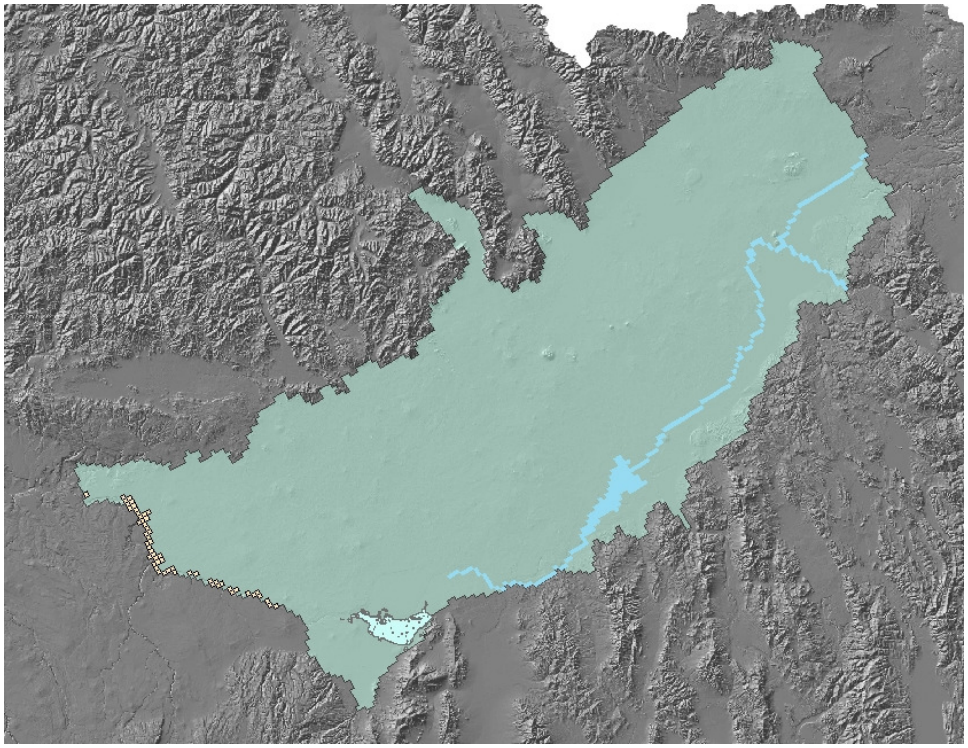


- Aberdeen-Springfield returns



- Aberdeen-Springfield returns





- Burley Irrigation District returns

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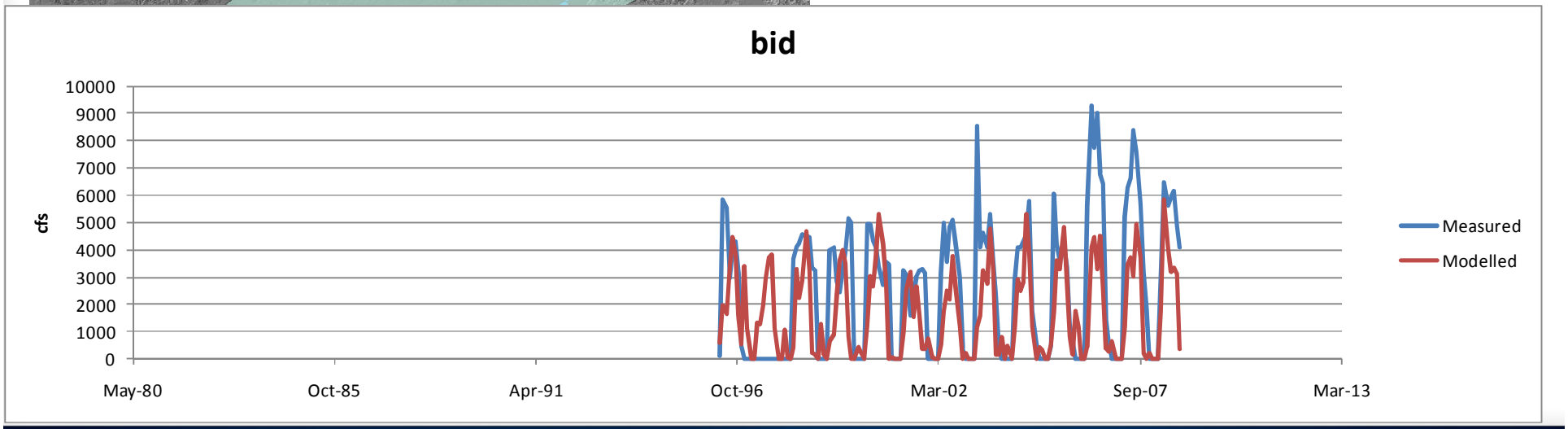

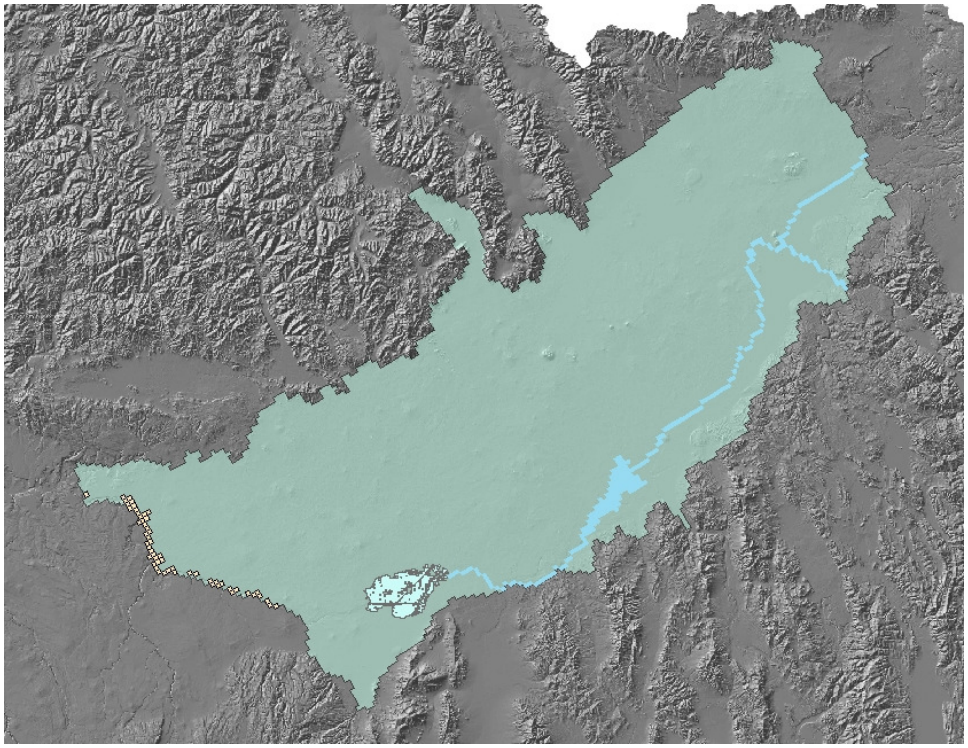

- Minidoka Irrigation District returns

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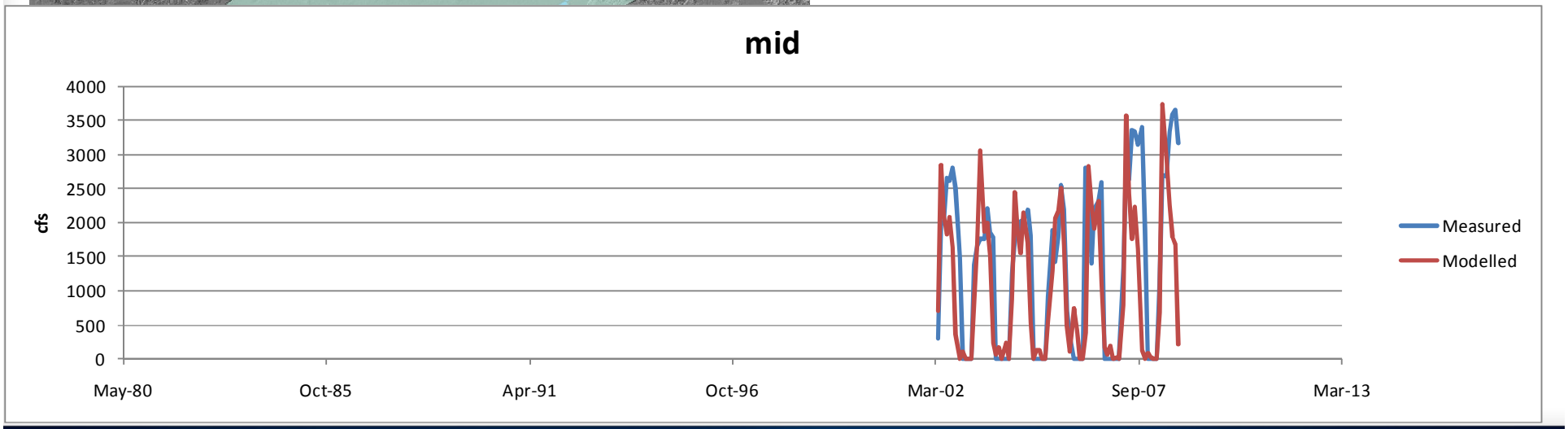
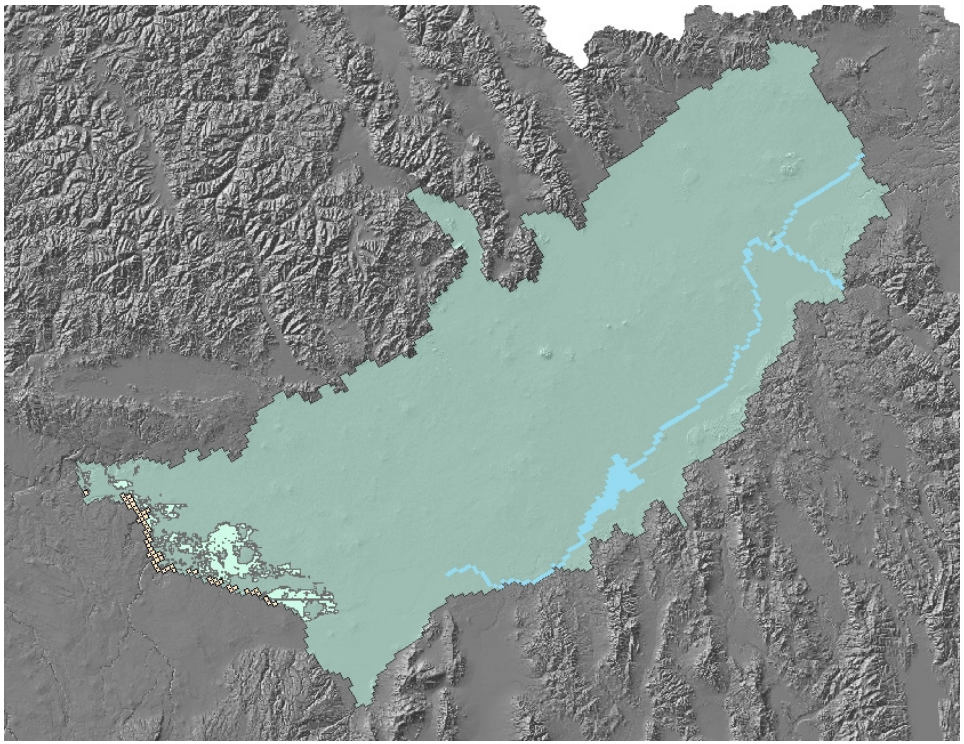
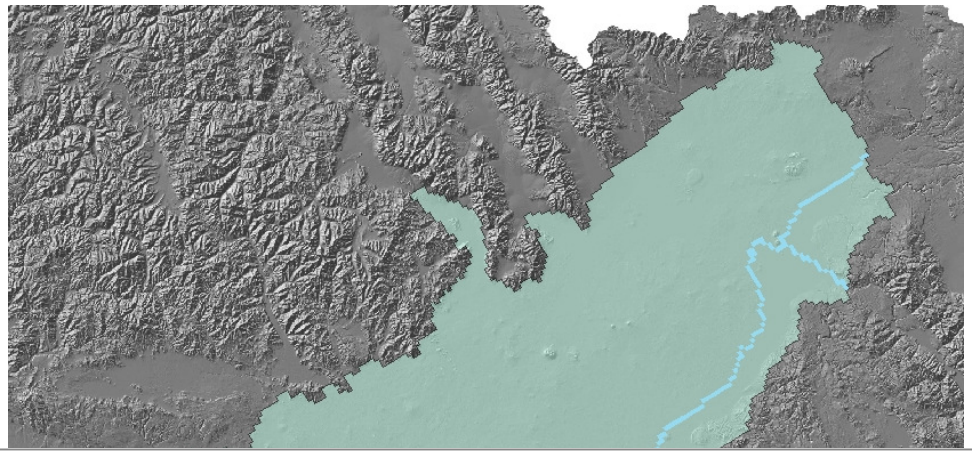
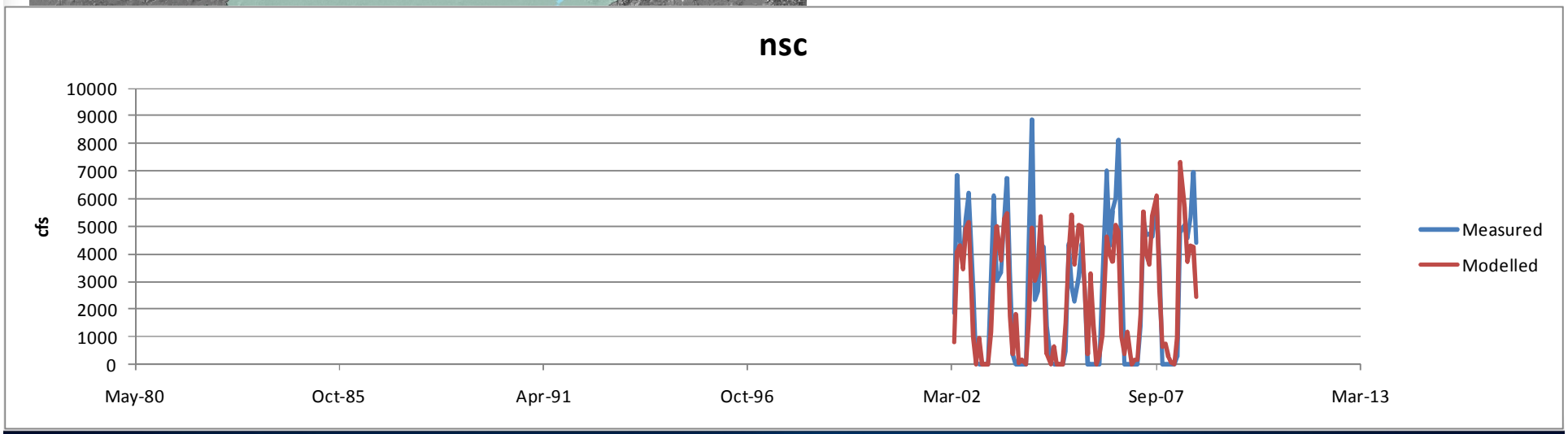




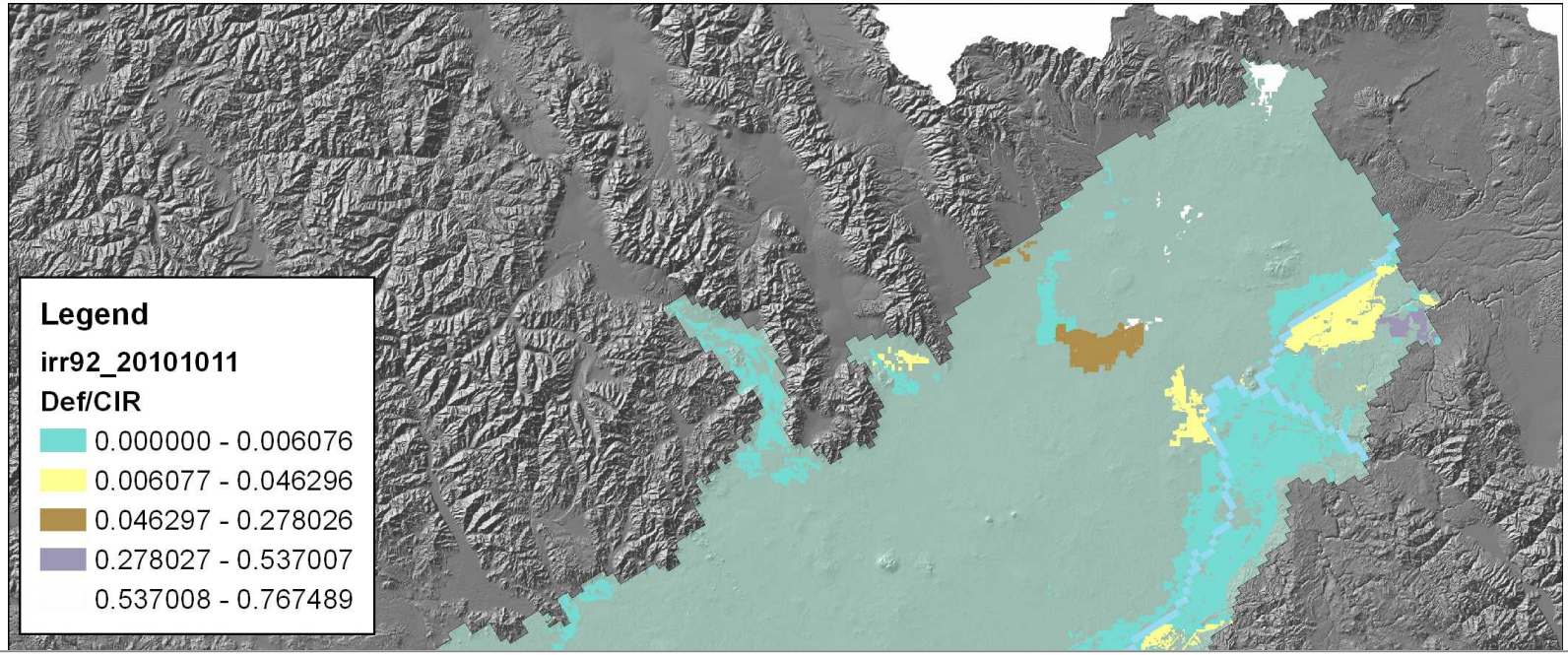
- North Side Canal Co returns

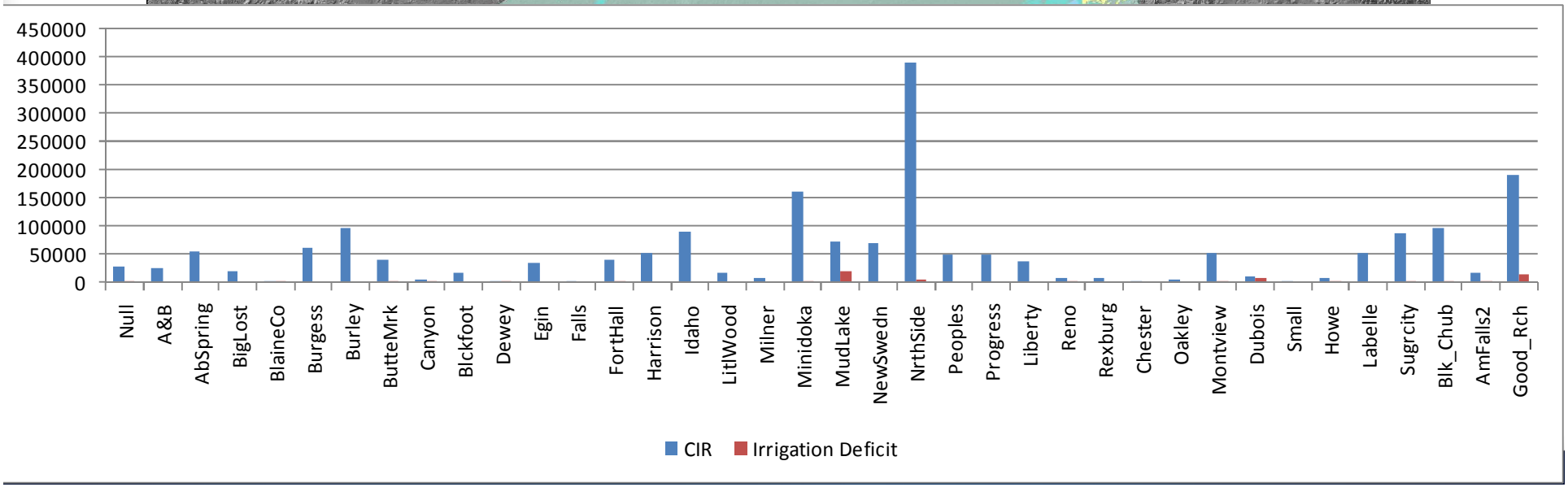


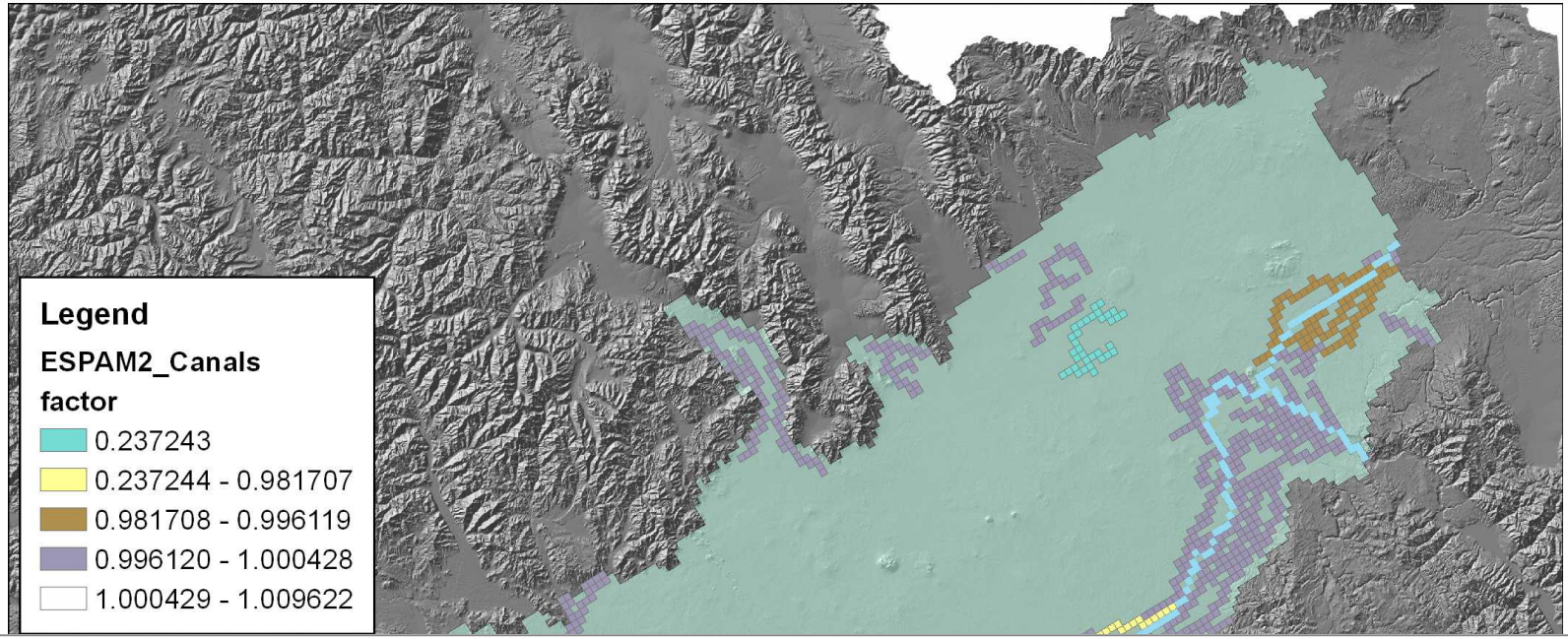
- North Side Canal Co returns



IDAHO Department of Water Resources



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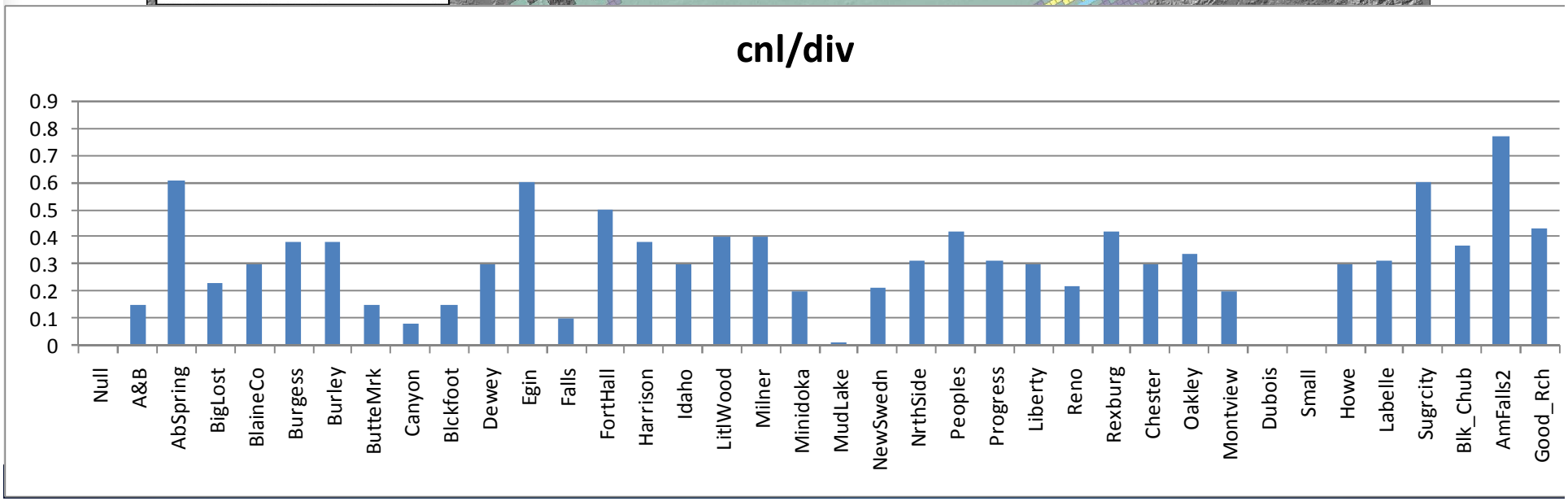
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END