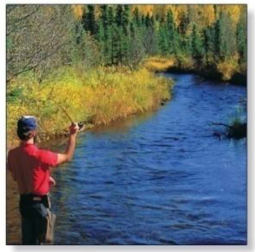
Next Steps

Presented by Allan Wylie IDWR

5 December 2013



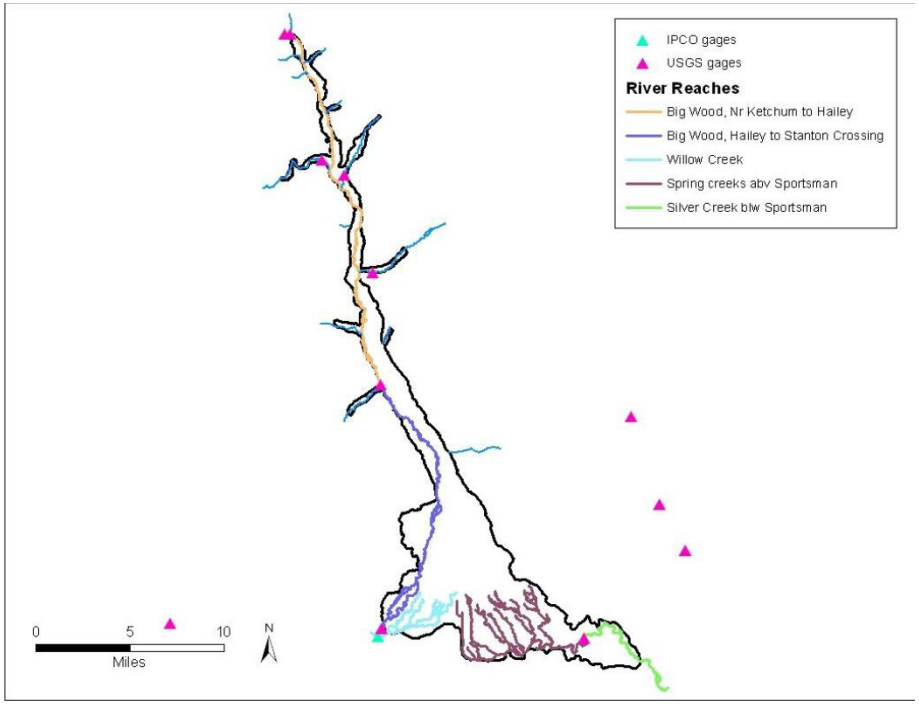
Outline

- Introduction
- Calibration Targets
- Adjustable Parameters
- Process

Calibration Targets

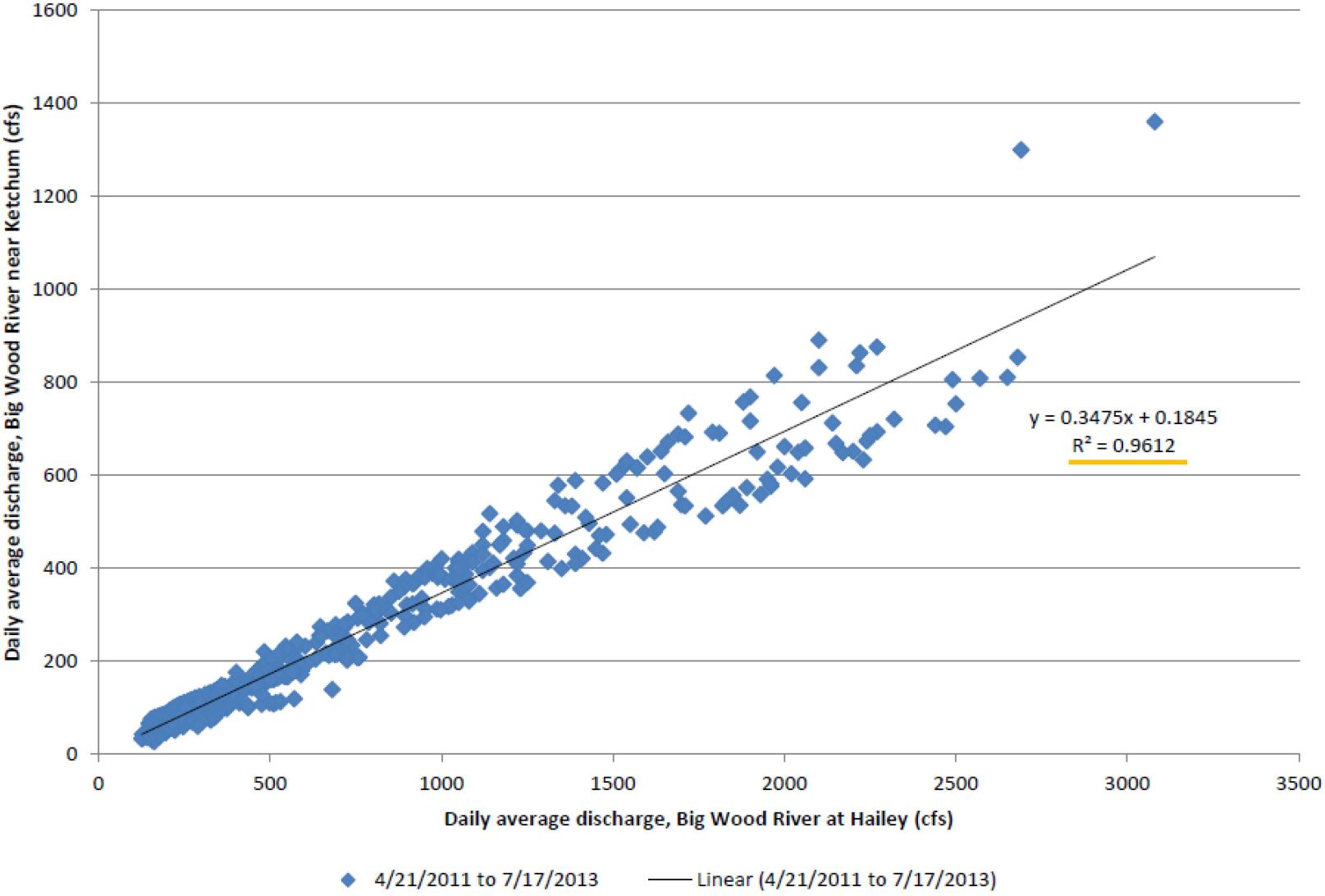
- River gains
  - Big Wood River
  - Silver Creek
  - Willow Creek
- Water levels in wells
- Underflow out of the model

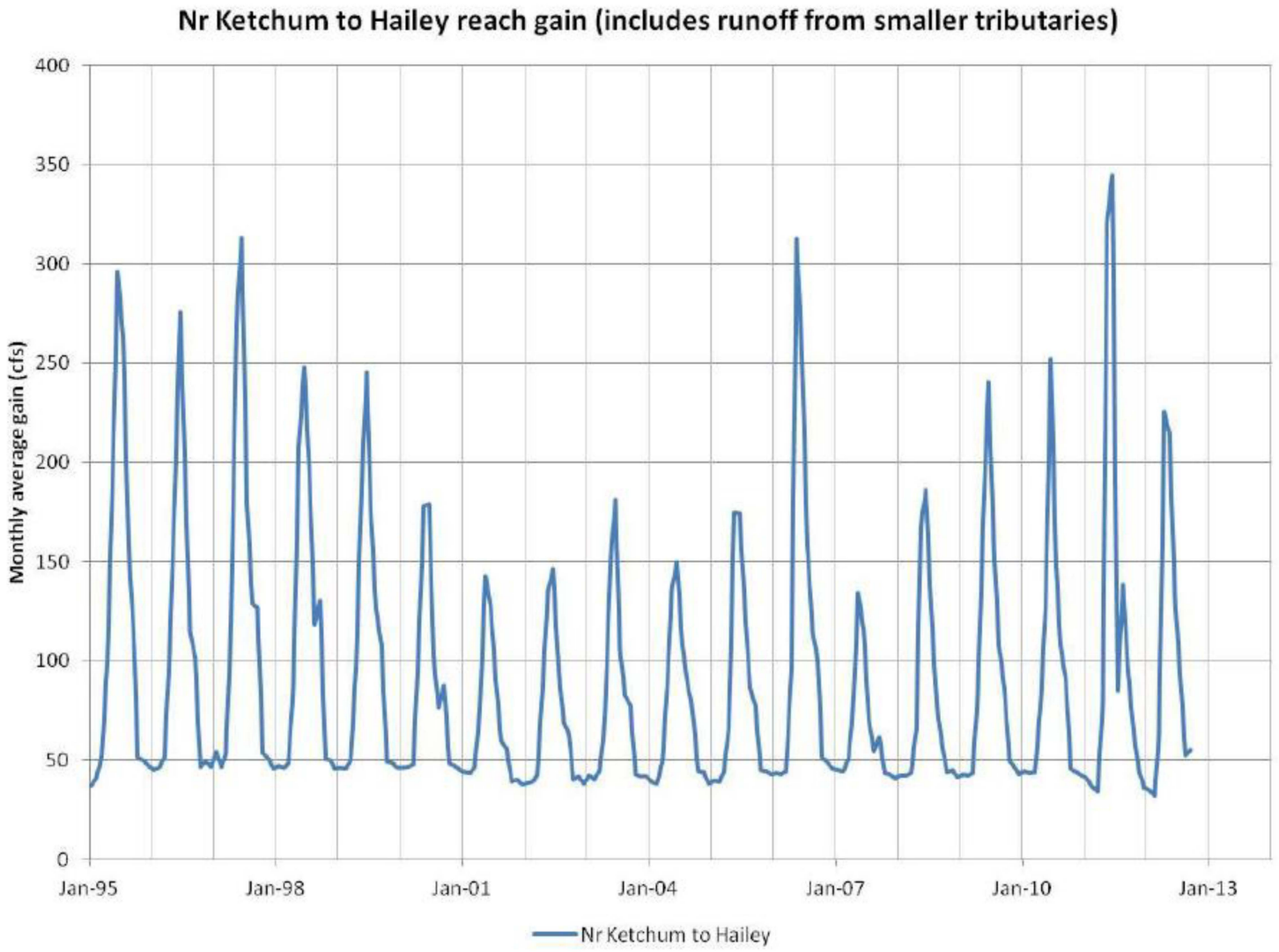
River gains

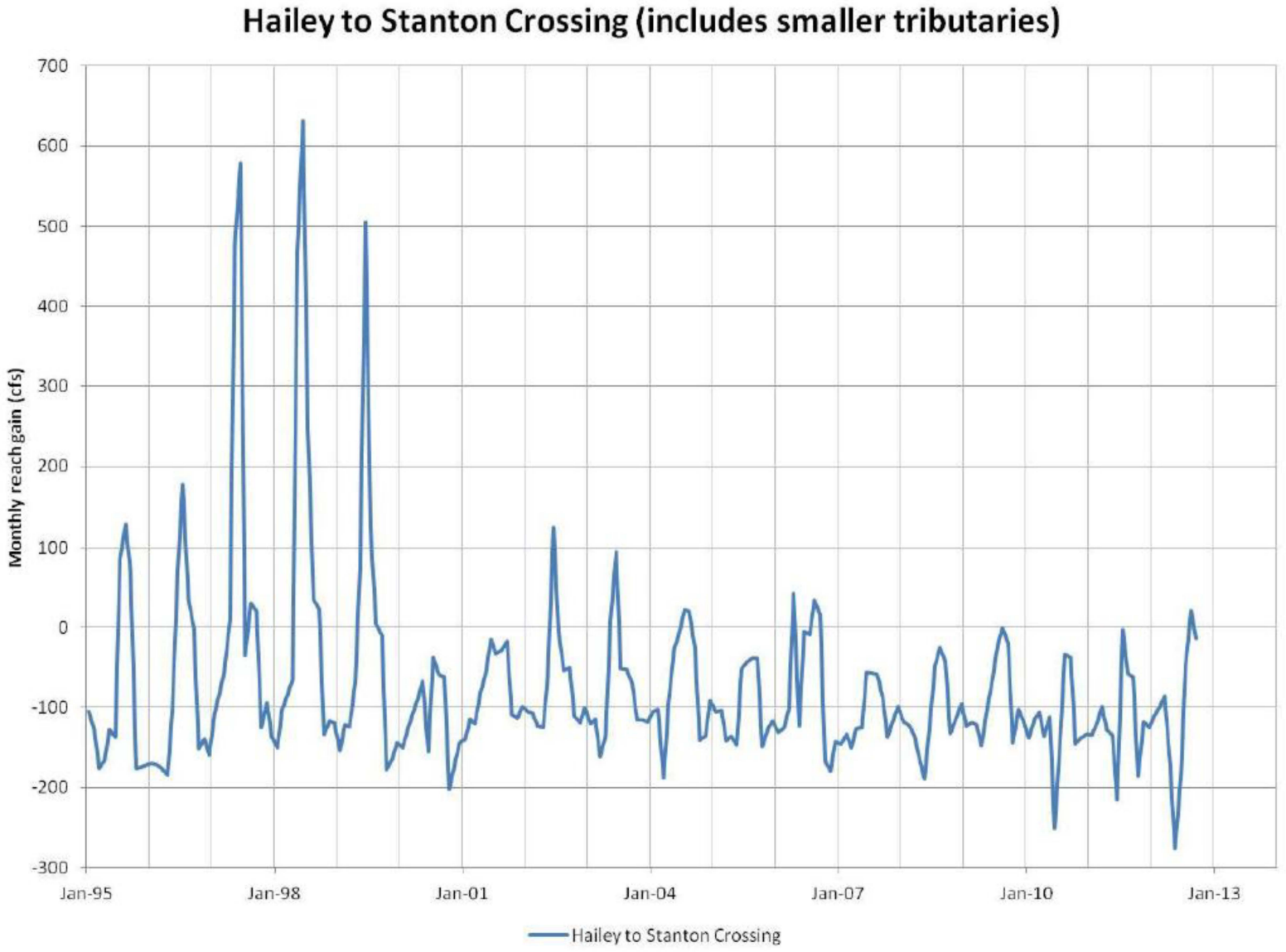


- Continuous stations
  - Big Wood nr Ketchum
    - 4/2011 – present
  - Big Wood River at Hailey
    - 7/1915 – present
  - Big Wood River at Stanton Crossing
    - 9/1996 – present
  - Silver Cr at Sportsman Access
    - 10/1974 – 9/2006
    - 10/2007 – present
  - Willow Cr
    - 6/2006 - present
- Seepage runs
  - August 2012
  - October 2012
  - March 2013

Near Ketchum vs. Hailey gage readings, 4/2011 - 7/2013



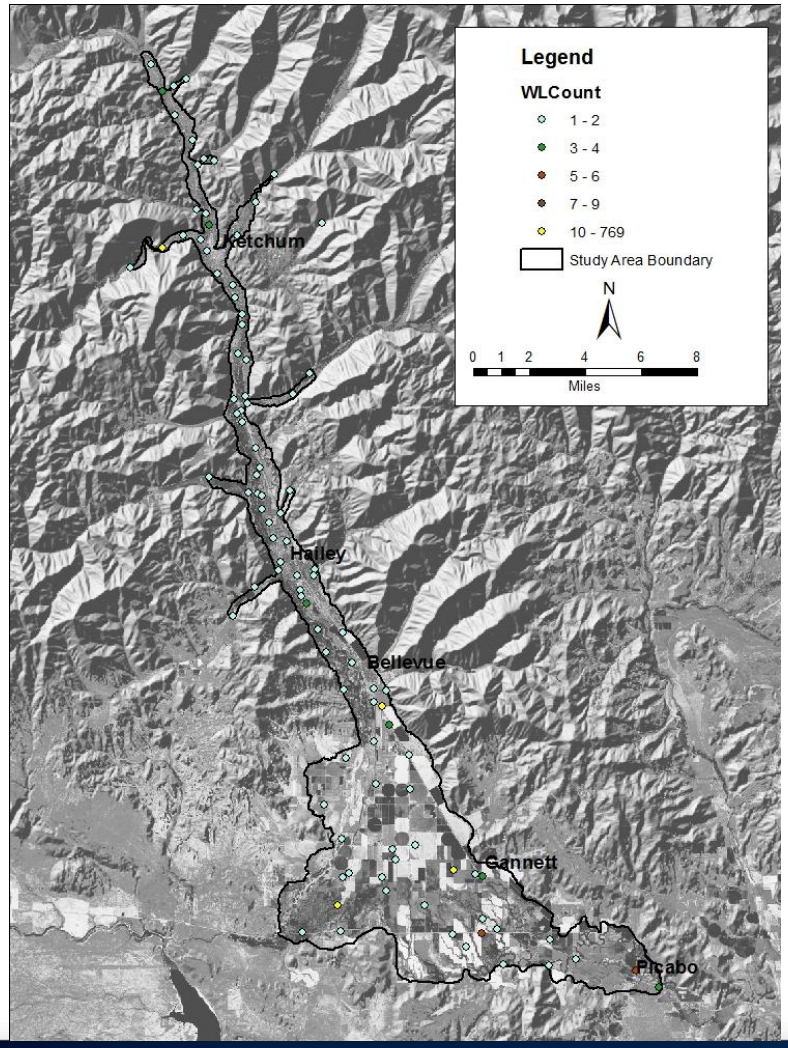

Nr Ketchum to Hailey reach gain (includes runoff from smaller tributaries)
Monthly average gain (cfs)
400
350
300
250
200
150
100
50
0
Jan-95
Jan-98
Jan-01
Jan-04
Jan-07
Jan-10
Jan-13
Nr Ketchum to Hailey


Hailey to Stanton Crossing (includes smaller tributaries)
Monthly reach gain (cfs)
700
600
500
400
300
200
100
0
-100
-200
-300
Jan-95
Jan-98
Jan-01
Jan-04
Jan-07
Jan-10
Jan-13
Hailey to Stanton Crossing

Flow in Big Wood River

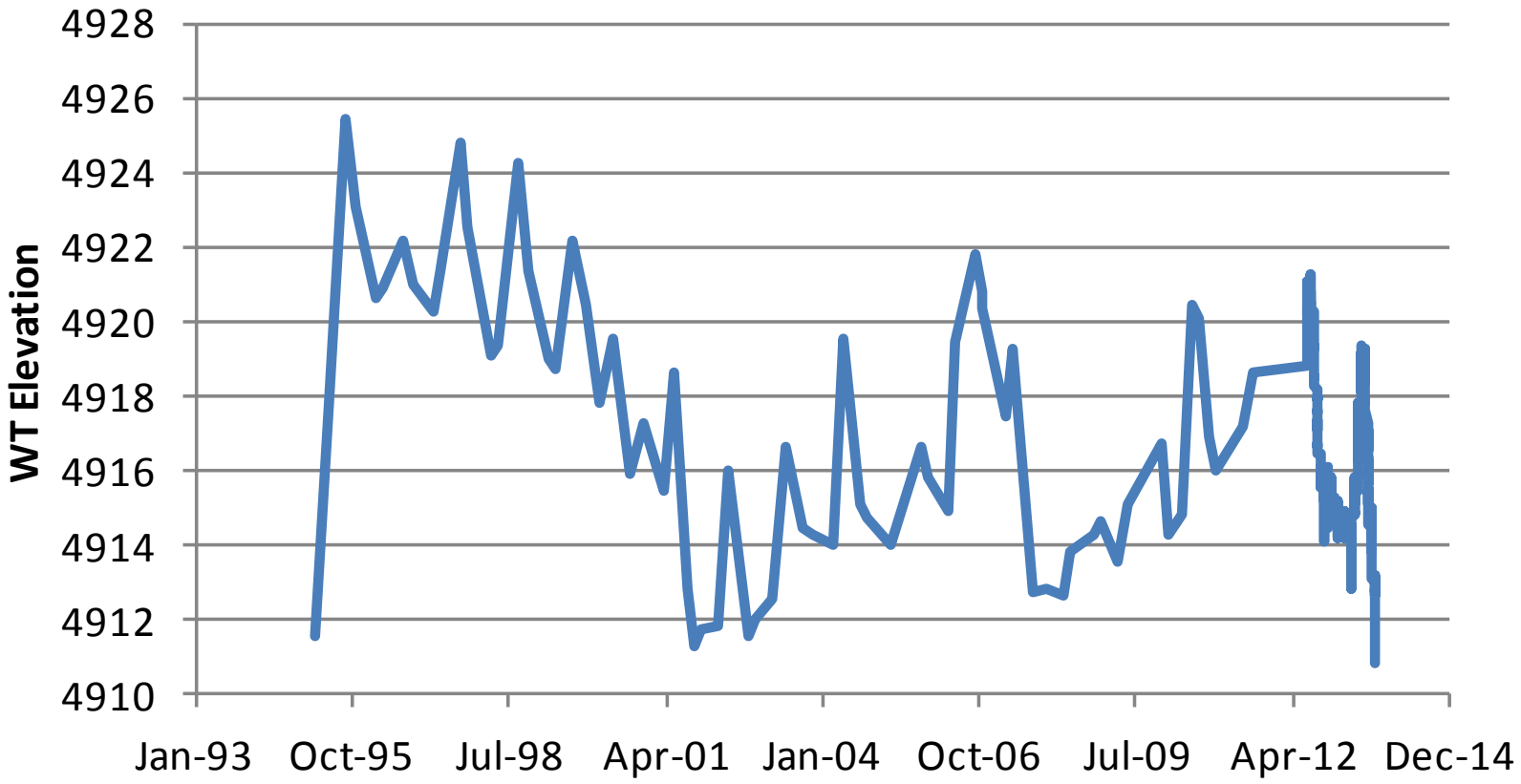
- With the stream flow routing package flow in the river can be used as a calibration target
- Possible additional targets could include making sure that the river is dry in the appropriate places at the appropriate times
  - Dry is not a continuous function
  - More on this later

Water levels in wells

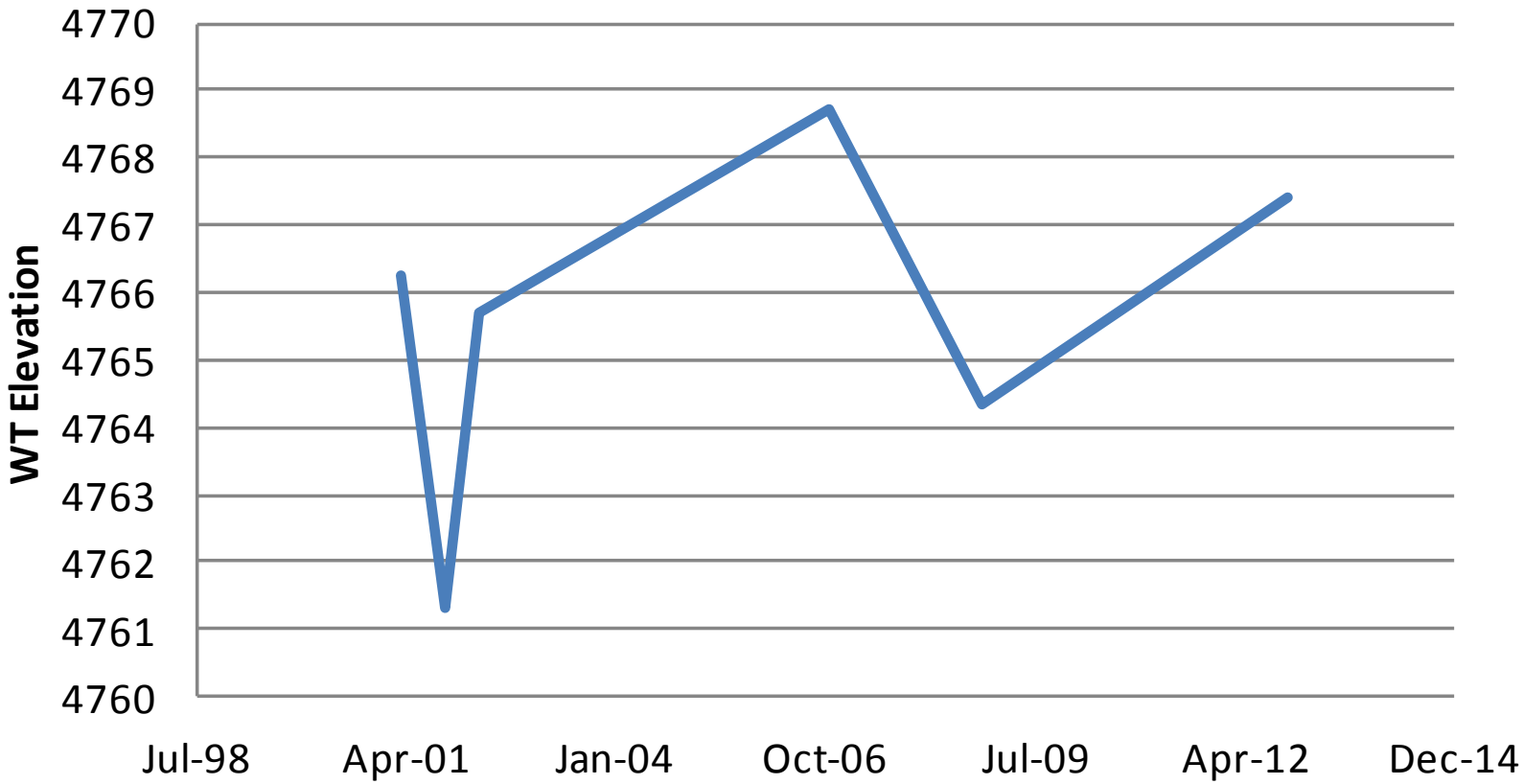


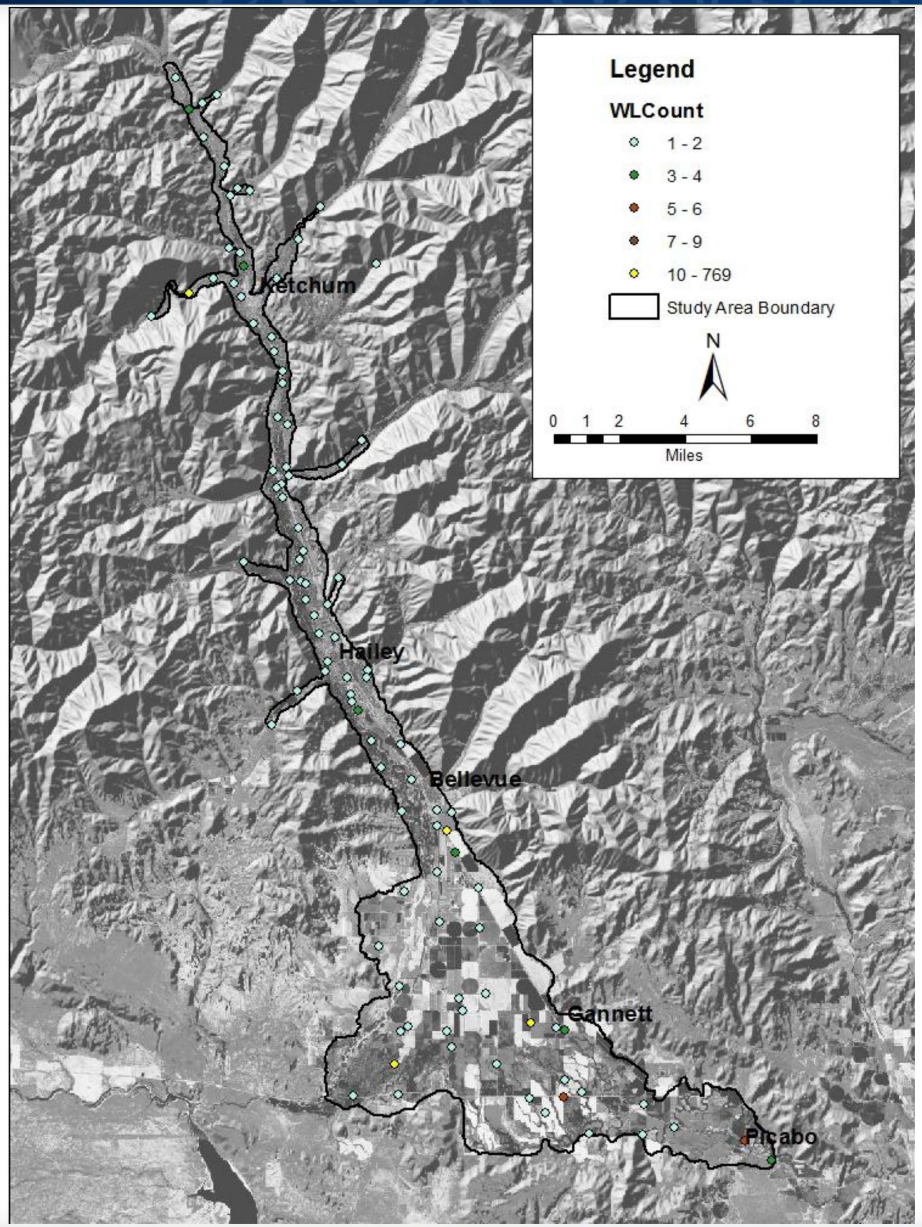
– Most wells don't have many measurements during the calibration period

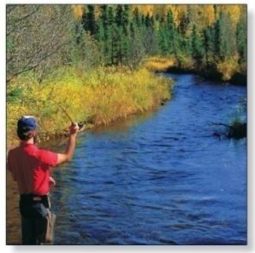
01S 19E 03CCB2



01S 20E 27BDA1



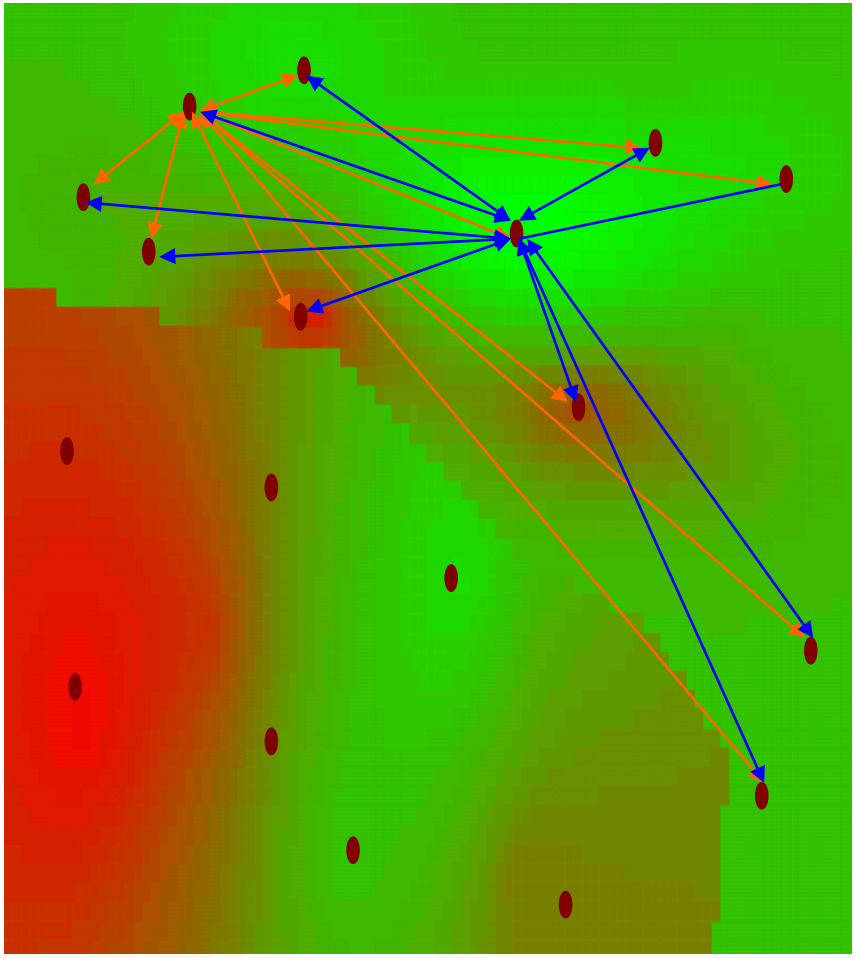

Legend
WLCount
1 - 2
3 - 4
5 - 6
7 - 9
10 - 769
Study Area Boundary
N
0 1 2 4 6 8
Miles
Ketchum
Hailey
Bellevue
Gannett
Picabo

Adjustable Parameters

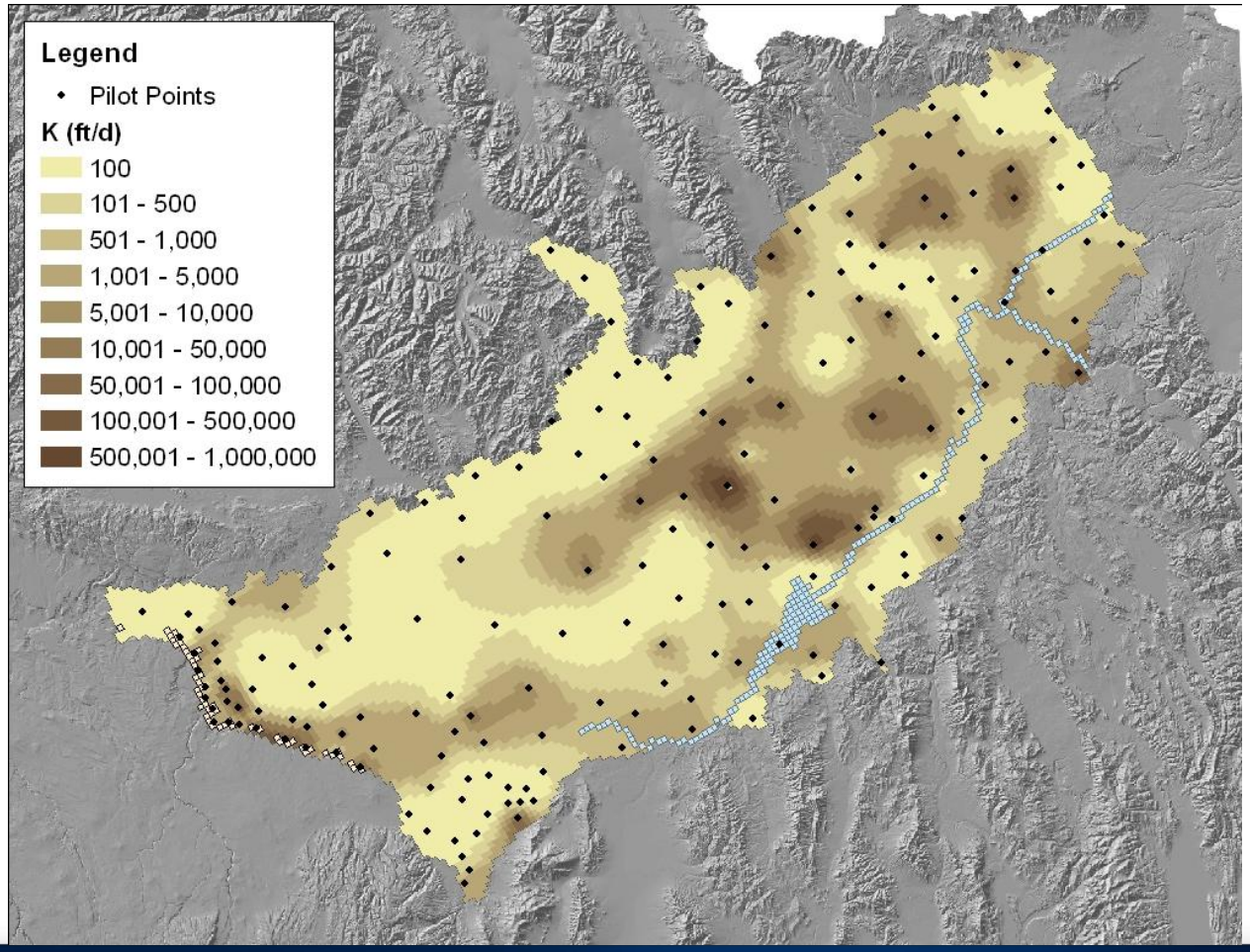
- Aquifer properties
  - Hydraulic conductivity
    - Pilot points
  - Specific yield
    - Pilot points
  - Riverbed conductance
  - Drain conductance
- Components of water budget
  - ET
    - By irrigation entity
  - Tributary inflow
    - By tributary valley
  - Canal seepage
    - By irrigation entity

Pilot Points

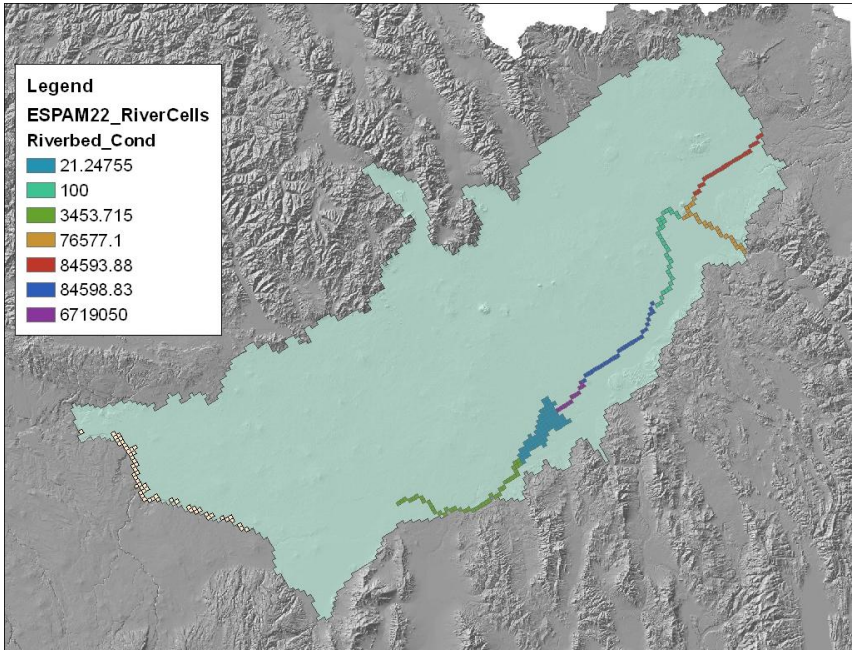


- Estimate hydraulic conductivity (K) or spacific yield (SY) at pilot points
- Interpolate values between pilot points

Pilot Points

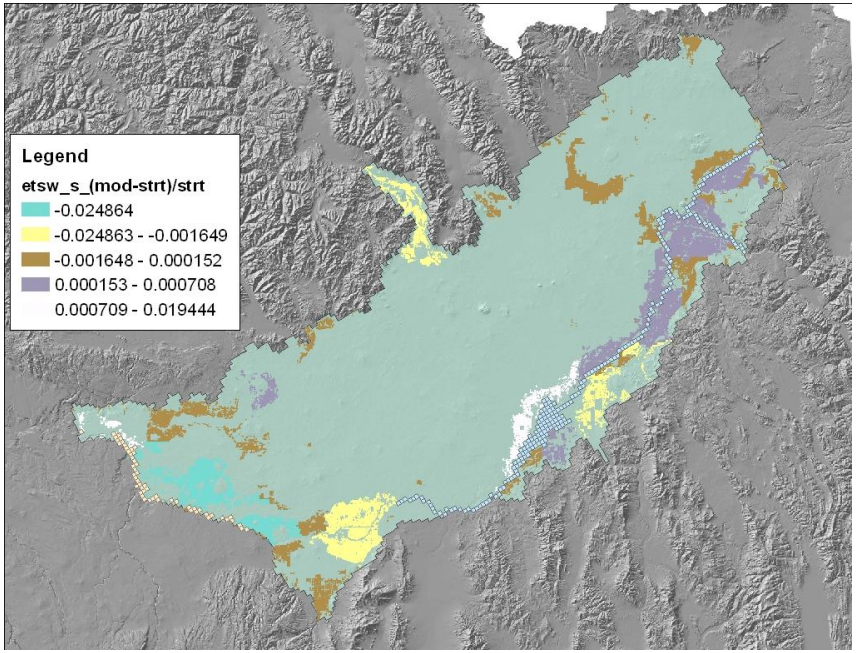


Riverbed Conductance (RBC)



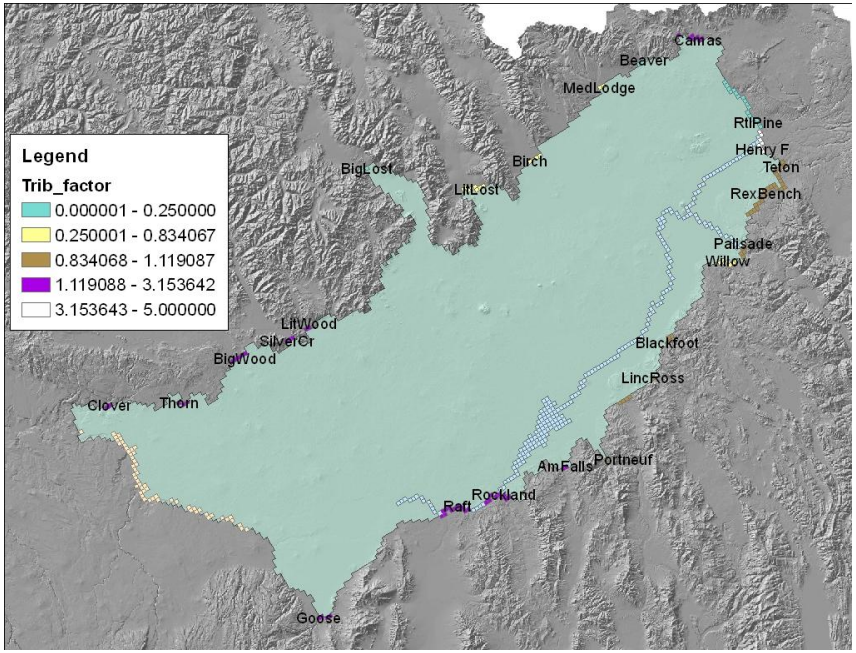
- Assign RBC by reach

Evapotranspiration (ET)



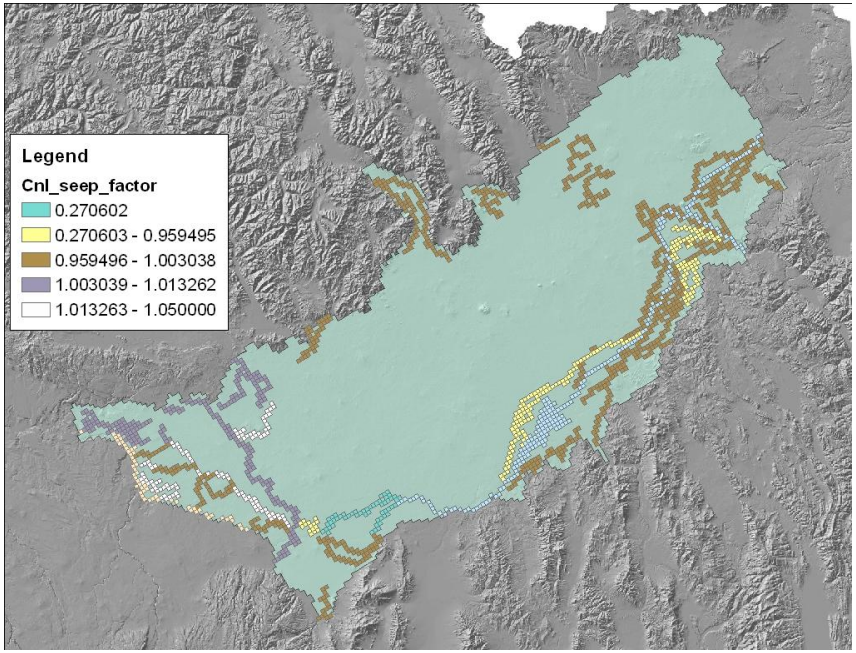
- Assign ET adjustment factors by entity
  - (model-start)/start

Tributary valley inflow (TRB)



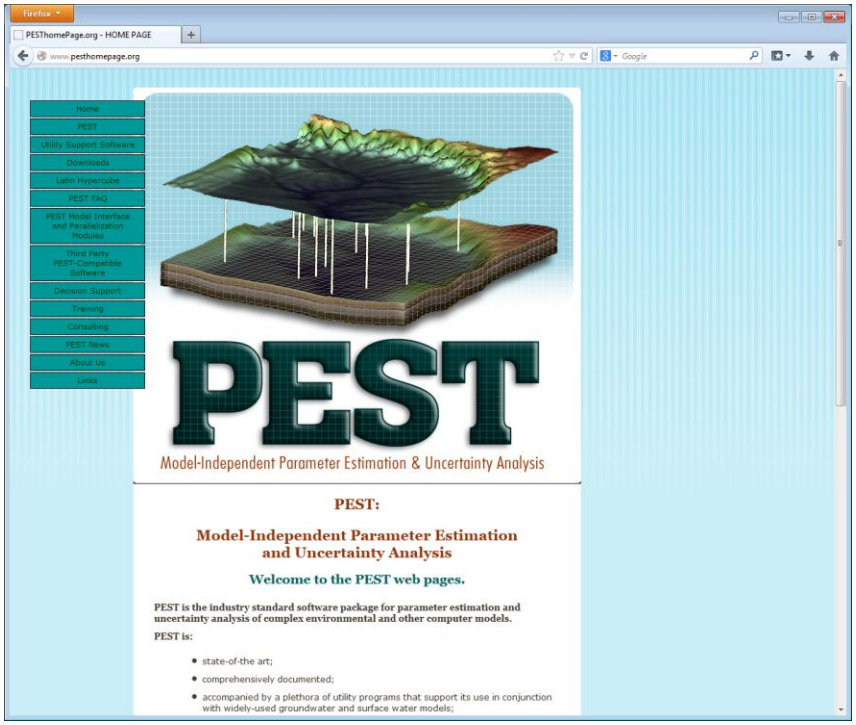
- Assign TRB adjustment tributary valley

Canal Seepage (CNL)



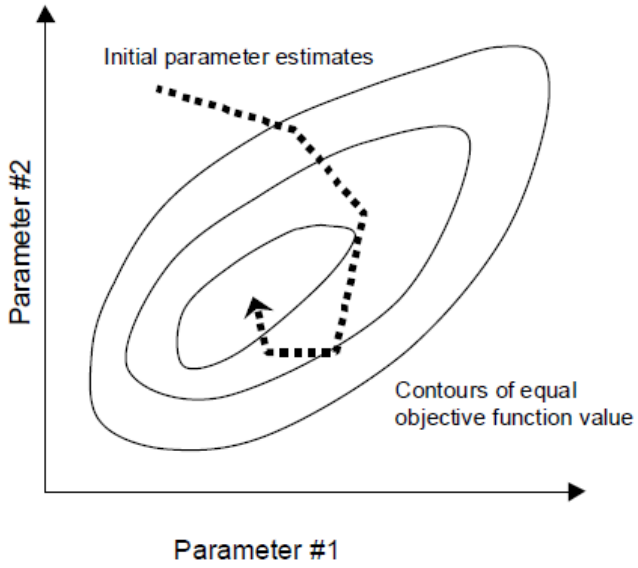
- Assign CNL adjustment factors by entity

PEST



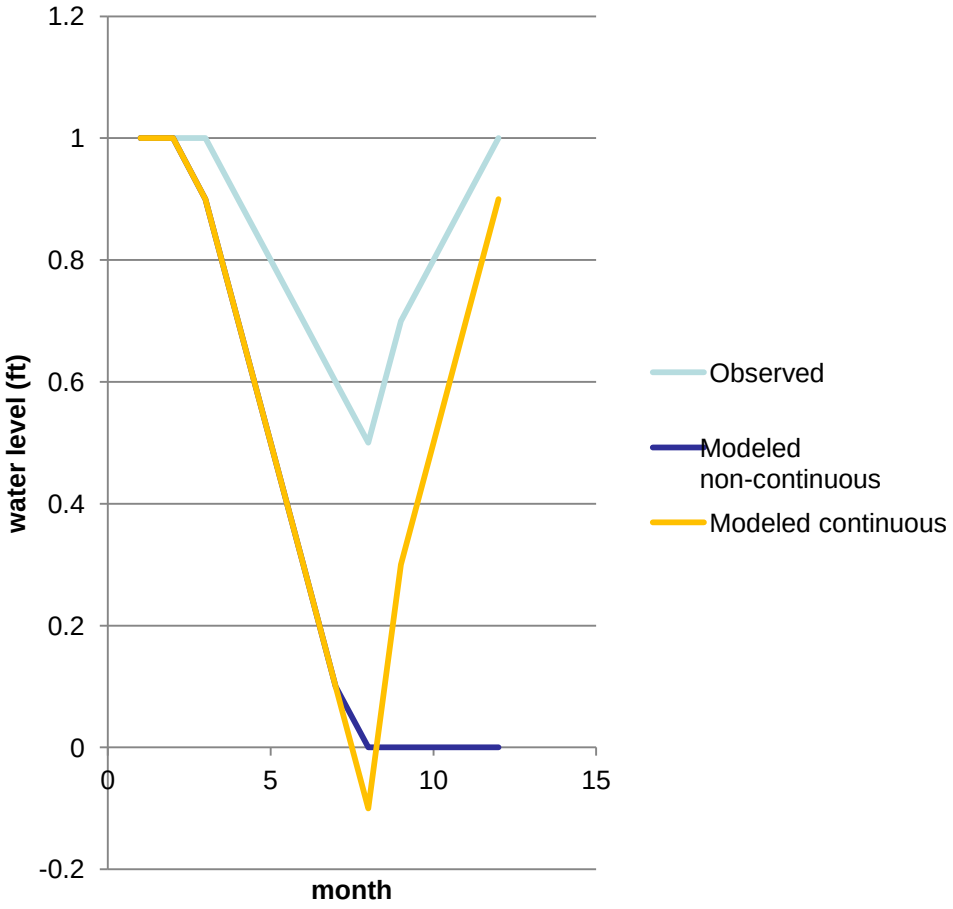
- Parameter ESTimation software (PEST) ‘http://www.pesthomepage.org/’
- PEST is the industry standard software package for parameter estimation and uncertainty analysis of complex environmental and other computer models.
- PEST does not have a Graphical User Interface (GUI), it works from the command line.

PEST



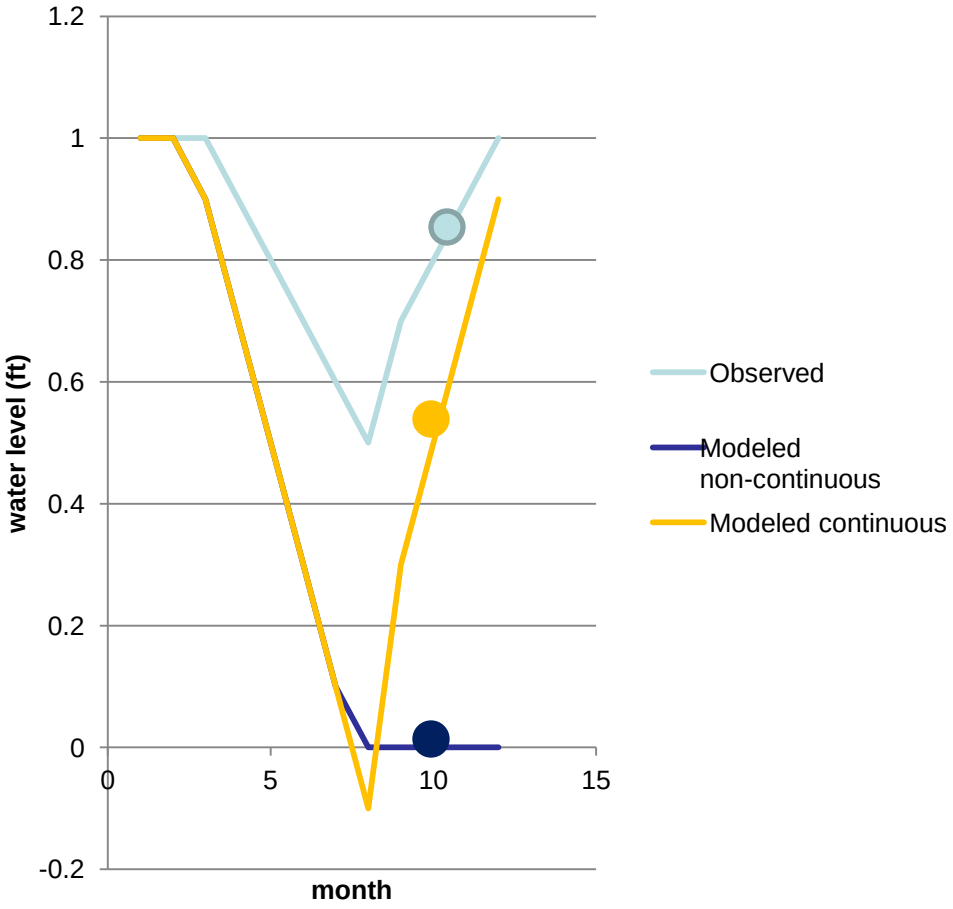
- Simple 2 parameter model
- Populate jacobian matrix
  - Adjust each parameter record impact of adjustment on every observation
- Calculate upgrade vector
- Move down upgrade vector comparing model output with field observations
- When match stops improving, stop and repopulate jacobian matrix
- etc

PEST



- Jacobian matrix
  - Change between model output and field observations with respect to change in model parameters
- Best if model output is continuous
  - i.e. decrease non-irrigated recharge results in lower water levels at well X
  - What if well goes dry?
    - Results in non-continuous output?
    - Wells actually go dry
    - What value do we hand to PEST?

PEST



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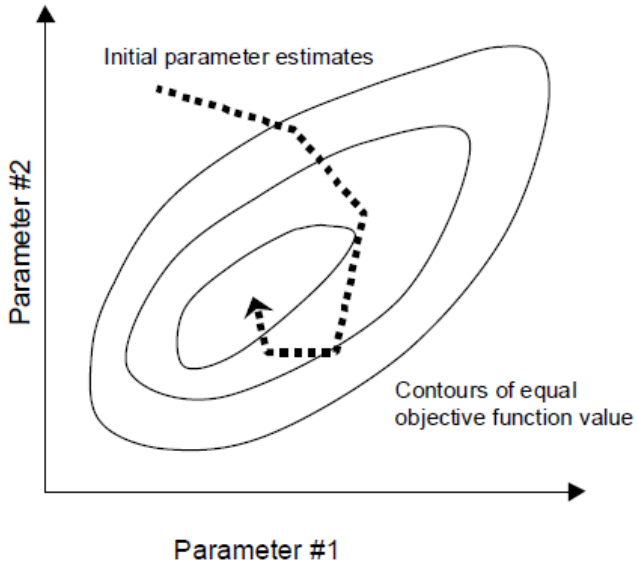
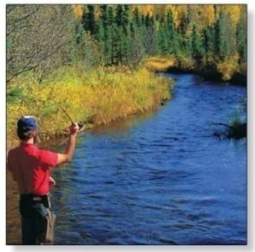
PEST



- Populate jacobian matrix using fixed transmissivity model
  - Wells can not go dry
- Calculate upgrade vector using jacobian populated with fixed transmissivity model
- Evaluate upgrade vector using variable transmissivity model
  - Wells can go dry

Conclusions

- Calibration Targets
  - River gains and losses
    - Flow in river
  - Water levels in wells
  - Outflow from model
- Adjustable Parameters
  - Hydraulic conductivity (K)
  - Specific yield (Sy)
  - Riverbed conductance (RBC)
  - Drain conductance (DC)
  - Evapotransporation adjustment factor (ET)
  - Tributary inflow adjustment factor (TRB)
  - Canal seepage factor (CNL)