



Treasure Valley Groundwater Flow Model

Presented by: Matt Anders, Technical Services Bureau Chief
Brian Patton, Executive Officer, Idaho Water Resource Board

Date: 11/6/2023

Project Initiation

- 2016 Senate Concurrent Resolution No. 137
 - WHEREAS, in select areas of the Treasure Valley, aquifer water levels are declining; and
 - WHEREAS, various studies predict significant population increases in the Treasure Valley over the next 50 years, placing additional demand on the aquifer; and
 - BE IT FURTHER RESOLVED that the Idaho Water Resource Board conduct aquifer recharge studies and develop a ground water model, with all necessary measurement networks, for the Treasure Valley Aquifer.
- The Idaho Water Resource Board (IWRB) made \$2.5 million available from the Aquifer Stabilization Program
 - \$700,000 To the University of Idaho to create evapotranspiration data
 - \$1,500,000 To the United States Geological Survey (USGS) to develop a model
USGS provided \$1,300,000 in matching funds

Model Development

- The USGS developed the Treasure Valley Groundwater Flow Model (TVGWF) with technical collaboration from the Idaho Department of Water Resources (IDWR) and stakeholders.
- Model Technical Advisory Committee
 - Open, transparent, and collaborative process
 - 18 meetings to discuss the details of data and model construction with participants from:
 - USGS
 - IDWR
 - Idaho Department of Environmental Quality
 - Idaho Geological Survey
 - City of Boise
 - City of Meridian
 - City of Nampa
 - Ada County
 - University of Idaho
 - Boise State University
 - Veolia
 - Micron Technology
 - Pioneer Irrigation District
 - Boise Project Board of Control
 - SPF Water Engineering
 - Rivers Edge Environmental Consulting
 - ERO Resources
 - Hydrologic, Inc
 - Idaho Water Engineering
 - Trout Unlimited

Model Development

- Model Data

- Historical

- Geology
- Streamflow
- Groundwater levels
- Diversions
- River seepage
- Precipitation



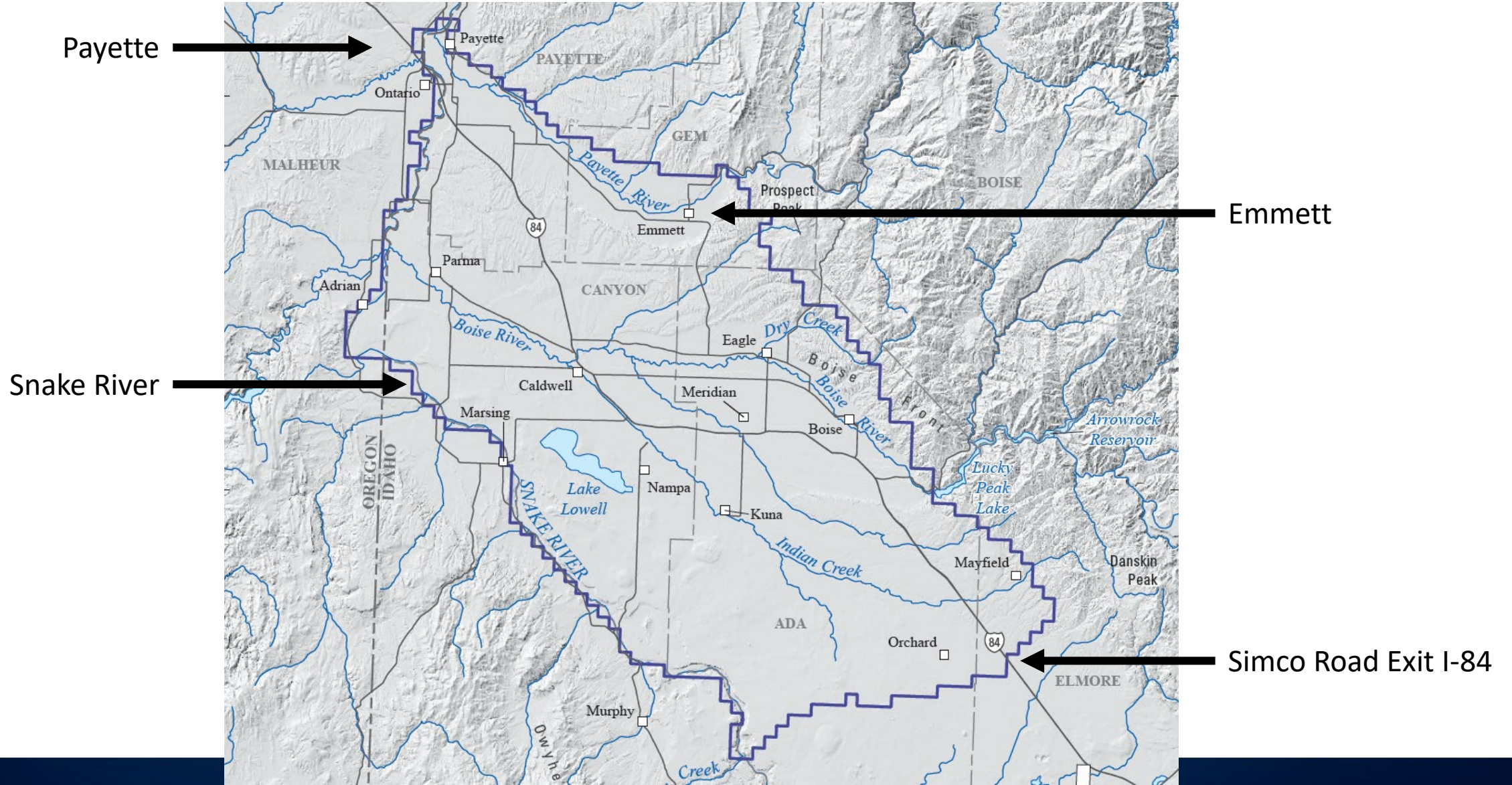
U.S. Geological Survey hydrographer making a stream-discharge measurement in Sand Run Gulch near Parma, Idaho. Photograph by James R. Bartolino, March 14, 2017.



- New

- Created evapotranspiration estimates for 8 years
- Created a land use dataset for 8 years
- Started/increased measurements on 10 agricultural drains in lower Boise Valley

Model Boundary



Model Completion

- The final model and report were released to the public in 2023
 - IDWR website <https://idwr.idaho.gov/water-data/projects/treasure-valley/>
 - Software **MODFLOW**
 - Developed by USGS
 - Free public domain software
 - Requires an experienced modeler
 - Command line (no graphical user interface)
 - Input and output files
- Technical training on the model was held by USGS in March 2023
 - Intended for modelers
 - ~25 participants from USGS, IDWR, and consultants

```

MODFLOW-2000
U.S. GEOLOGICAL SURVEY MODULAR FINITE-DIFFERENCE GROUND-WATER FLOW MODEL
Version 1.17.01 09/22/2006

Using NAME file: ..\data\tc1.nam

Run start date and time (yyyy/mm/dd hh:mm:ss): 2007/01/25 13:58:01

STARTING VALUES OF REGRESSION PARAMETERS :
WELLS_TR    RCH_ZONE_1  RCH_ZONE_2  RIVERS      SS_1      HK_1
VERT_K_CB   SS_2        HK_2
-1.100      63.07       31.54       1.2000E-03  1.3000E-03  3.0000E
1.0000E-07  2.0000E-04  4.0000E-05

TOTAL SUM OF SQUARED, WEIGHTED RESIDUALS: 0.268E+06

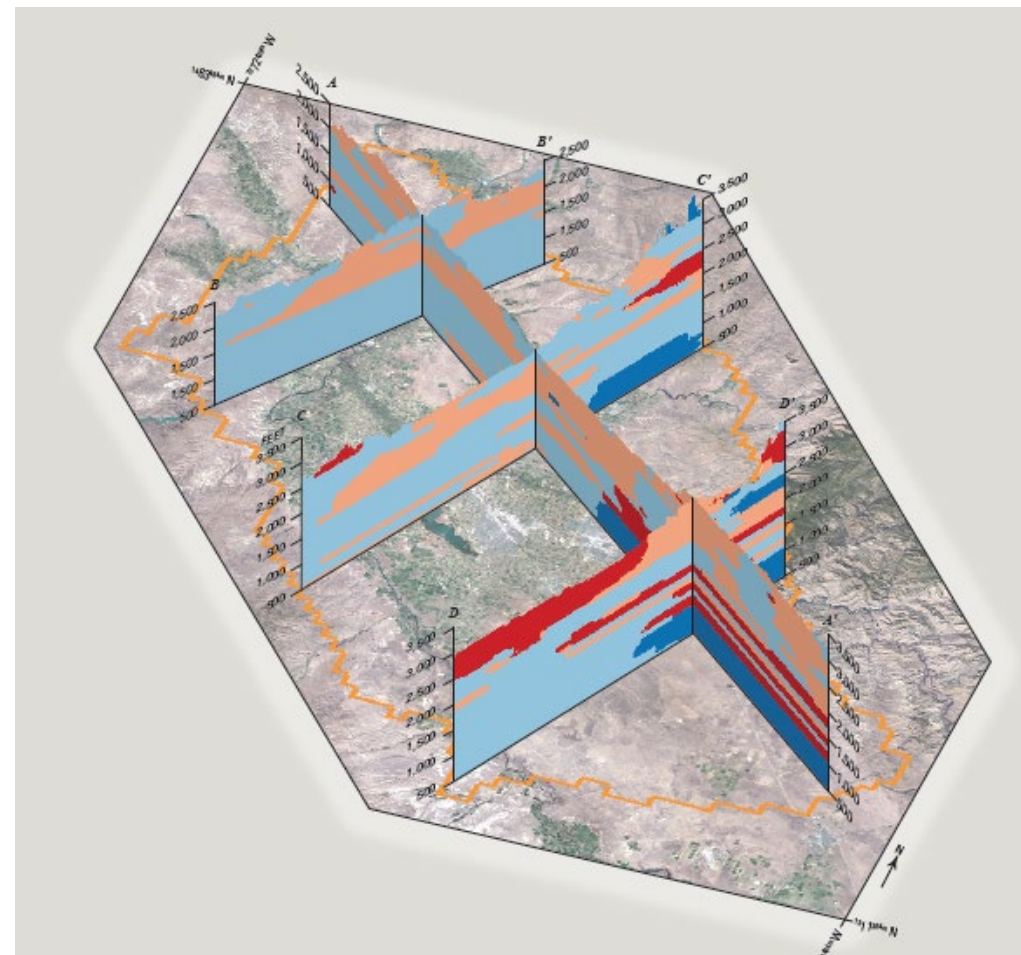
MODIFIED GAUSS-NEWTON PROCEDURE FOR PARAMETER-ESTIMATION ITERATION NO. =
VALUES FROM SOLVING THE NORMAL EQUATION :
MARQUARDT PARAMETER ----- = 0.0000
MAX. FRAC. PAR. CHANGE (TOL= 0.100E-01) = 0.86566
OCCURRED FOR PARAMETER "VERT_K_CB " TYPE P

CALCULATION OF DAMPING PARAMETER
MAX-CHANGE SPECIFIED: 2.0      USED: 2.0
OSCILL. CONTROL FACTOR (1, NO EFFECT)--- = 1.0000
DAMPING PARAMETER (RANGE 0 TO 1) ----- = 1.0000
CONTROLLED BY PARAMETER "VERT_K_CB " TYPE P

UPDATED ESTIMATES OF REGRESSION PARAMETERS :
WELLS_TR    RCH_ZONE_1  RCH_ZONE_2  RIVERS      SS_1      HK_1
VERT_K_CB   SS_2        HK_2
-1.001      39.23       43.71       2.1128E-04  1.2206E-03  3.9334E
1.8657E-07  8.7307E-05  4.2769E-05
    
```

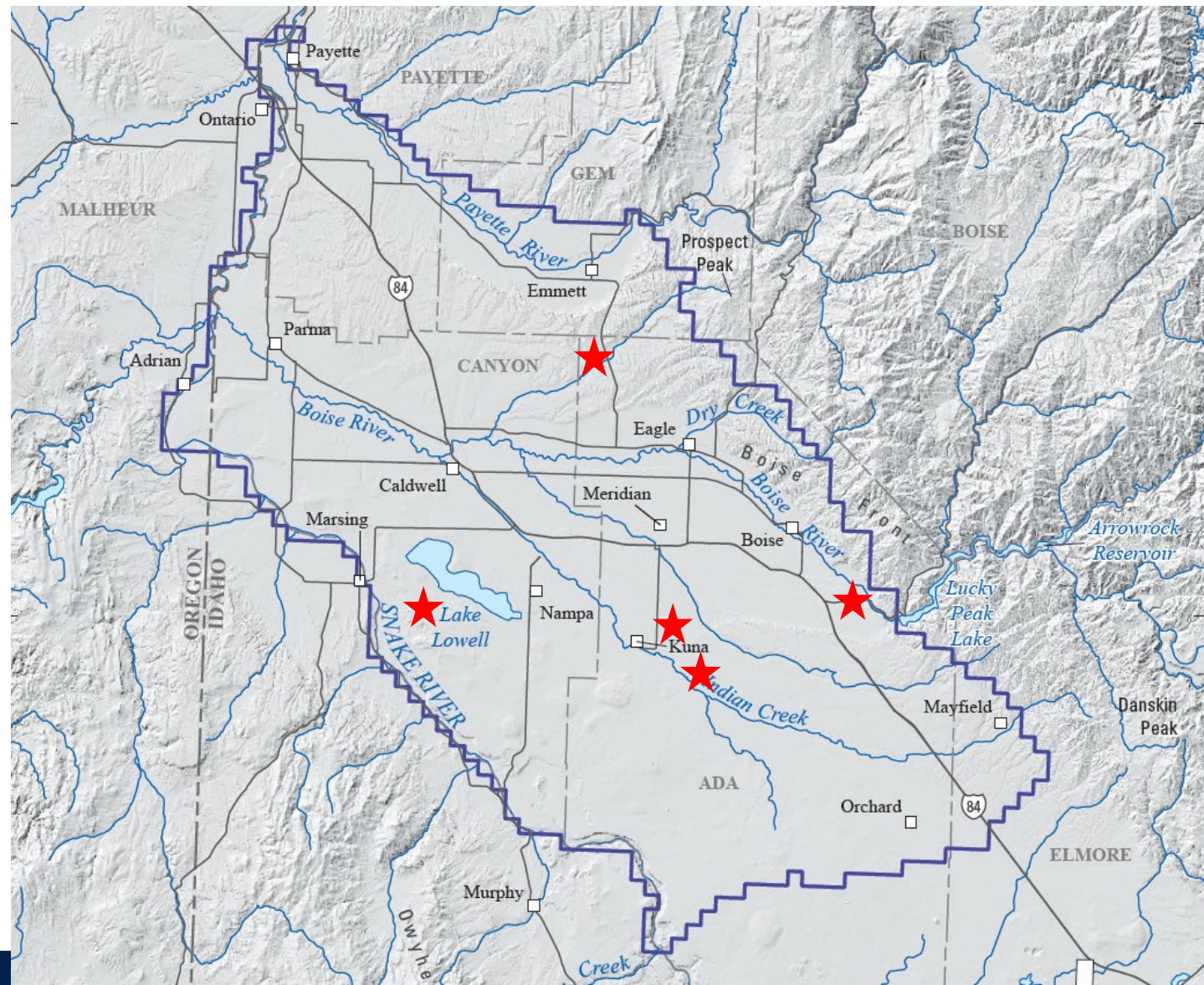

Model Use

- The TVGWFM is intended for regional-scale planning or water use changes
 - Urbanization
 - Groundwater development
 - Managed groundwater recharge activities
 - Surface water and groundwater conjunctive administration
- Constraints
 - 1-mile by 1-mile grid cells
 - Geology is complex
- Model will improve with use and enhancements
 - Example: Eastern Snake Plain Aquifer Model
 - Version 1.1 2005 - 2013
 - Version 2.1 2013 - 2021
 - Version 2.2 2021 - Present



IWRB Recharge Scenario Project

- Contractor: Brown and Caldwell
- Use the TVGWFM to simulate 8 managed recharge scenarios
 - Highway 16
 - SE Boise
 - Kuna
 - Lake Lowell
- Quantify the impact of managed recharge
 - Groundwater levels
 - Streamflow
 - Agricultural drain flow
 - Aquifer storage
 - Impact on the lower New York Canal and Lake Lowell
- Project complete by March 15, 2024



Questions?

Matt Anders
(208) 287-4932
matthew.anders@idwr.idaho.gov

Brian Patton
(208) 287-4837
brian.patton@idwr.idaho.gov

