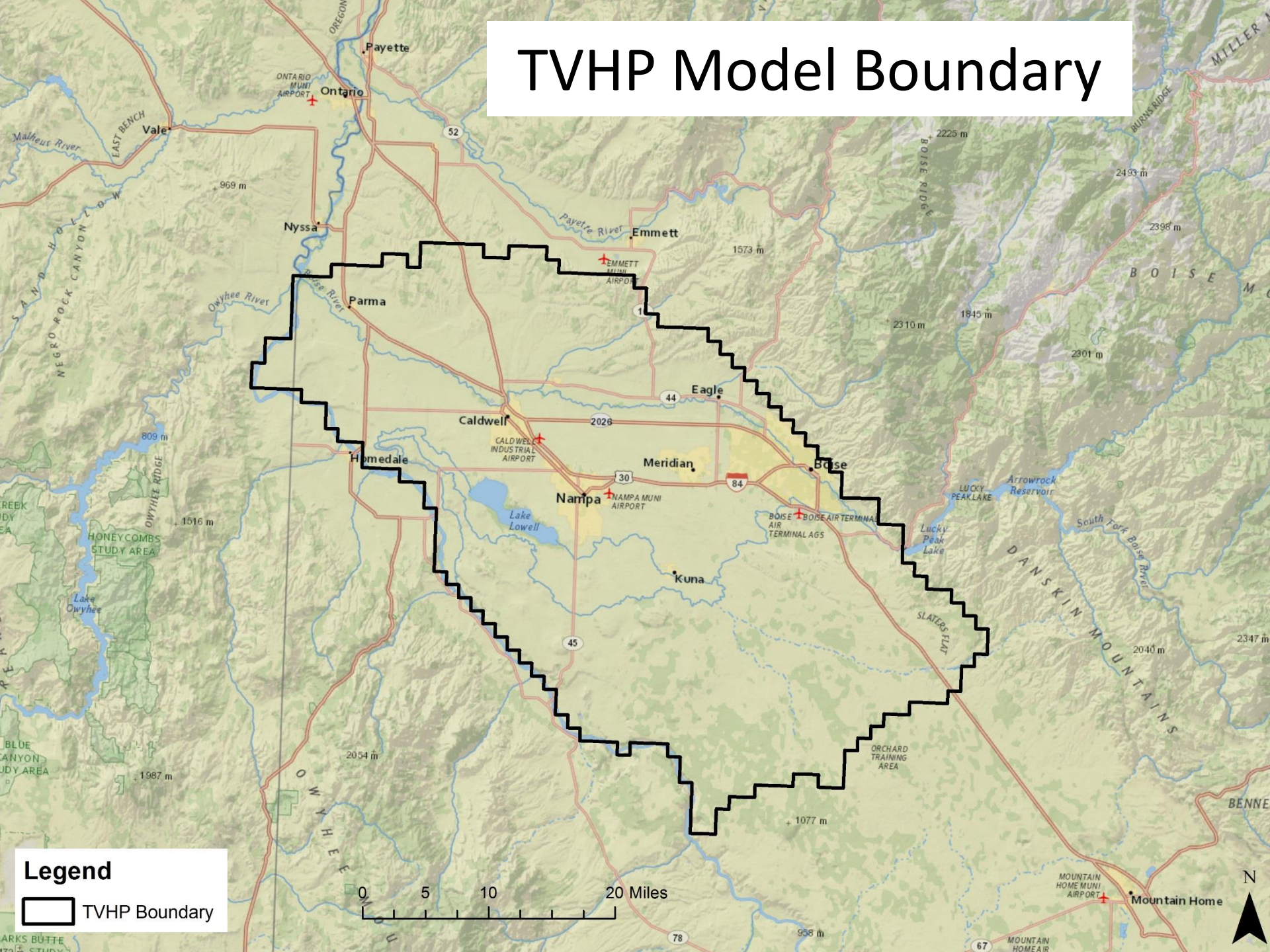
Treasure Valley Groundwater Flow Model Update

Presented to the Idaho Water Users Association
by Sean Vincent, P.G.

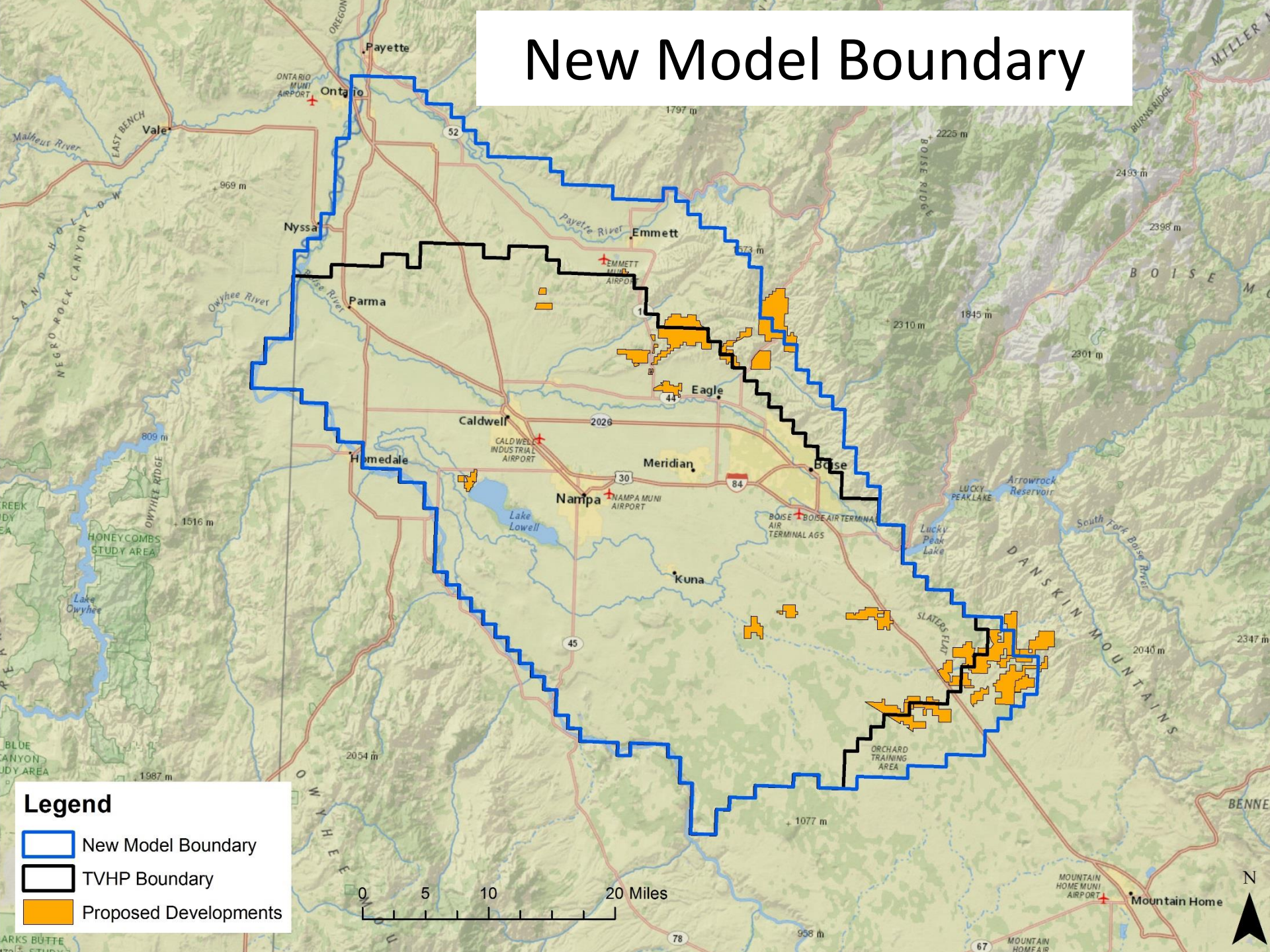
January 21, 2020

Project description

- Developing transient groundwater flow model
  - Builds on previous TVHP modeling effort


TVHP Model Boundary
Payette
Ontario
Vale
Nyssa
Parma
Emmett
Eagle
Caldwell
Homedale
Meridian
Boise
Nampa
Kuna
Mountain Home
Legend
TVHP Boundary
0 5 10 20 Miles
N

New Model Boundary



Project description

- Developing transient groundwater flow model
  - Builds on previous TVHP modeling effort

- Collaboration w/ U.S. Geological Survey

USGS/IDWR Final Reports

SVRP

USGS
science for a changing world

Prepared in cooperation with the
IDAHO DEPARTMENT OF WATER RESOURCES
WASHINGTON STATE DEPARTMENT OF ECOLOGY
UNIVERSITY OF IDAHO
WASHINGTON STATE UNIVERSITY

Ground-Water Flow Model for the Spokane Valley-Rathdrum Prairie Aquifer, Spokane County, Washington, and Bonner and Kootenai Counties, Idaho

Scientific Investigations Report 2007–5044

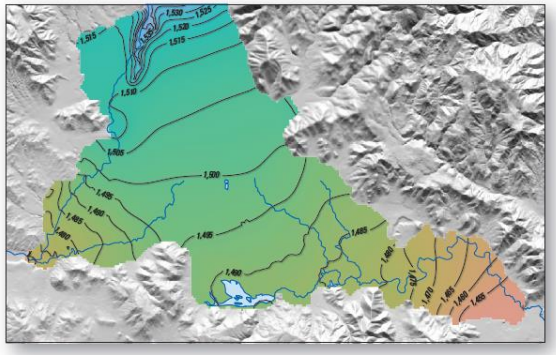
U.S. Department of the Interior
U.S. Geological Survey

WRV

USGS
science for a changing world

Prepared in cooperation with the Idaho Department of Water Resources

Groundwater-Flow Model for the Wood River Valley Aquifer System, South-Central Idaho



Scientific Investigations Report 2016–5080

U.S. Department of the Interior
U.S. Geological Survey

Project description

- Developing transient groundwater flow model
  - Builds on previous TVHP modeling effort

- Collaboration w/ U.S. Geological Survey
  - Stakeholder input from Modeling Technical Advisory Committee

MTAC meeting

Project description

- Developing transient groundwater flow model
  - Builds on previous TVHP modeling effort
- Collaboration w/ U.S. Geological Survey
  - Stakeholder input from Modeling Technical Advisory Committee
- Funding from IWRB with federal matching funds from USGS

Project scope and schedule

- 5 year project w/ 4 overlapping phases
  - Phase 1 project initiation (complete)

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IDWR

A Groundwater-Flow Model for the Treasure Valley and Surrounding Area, Southwestern Idaho

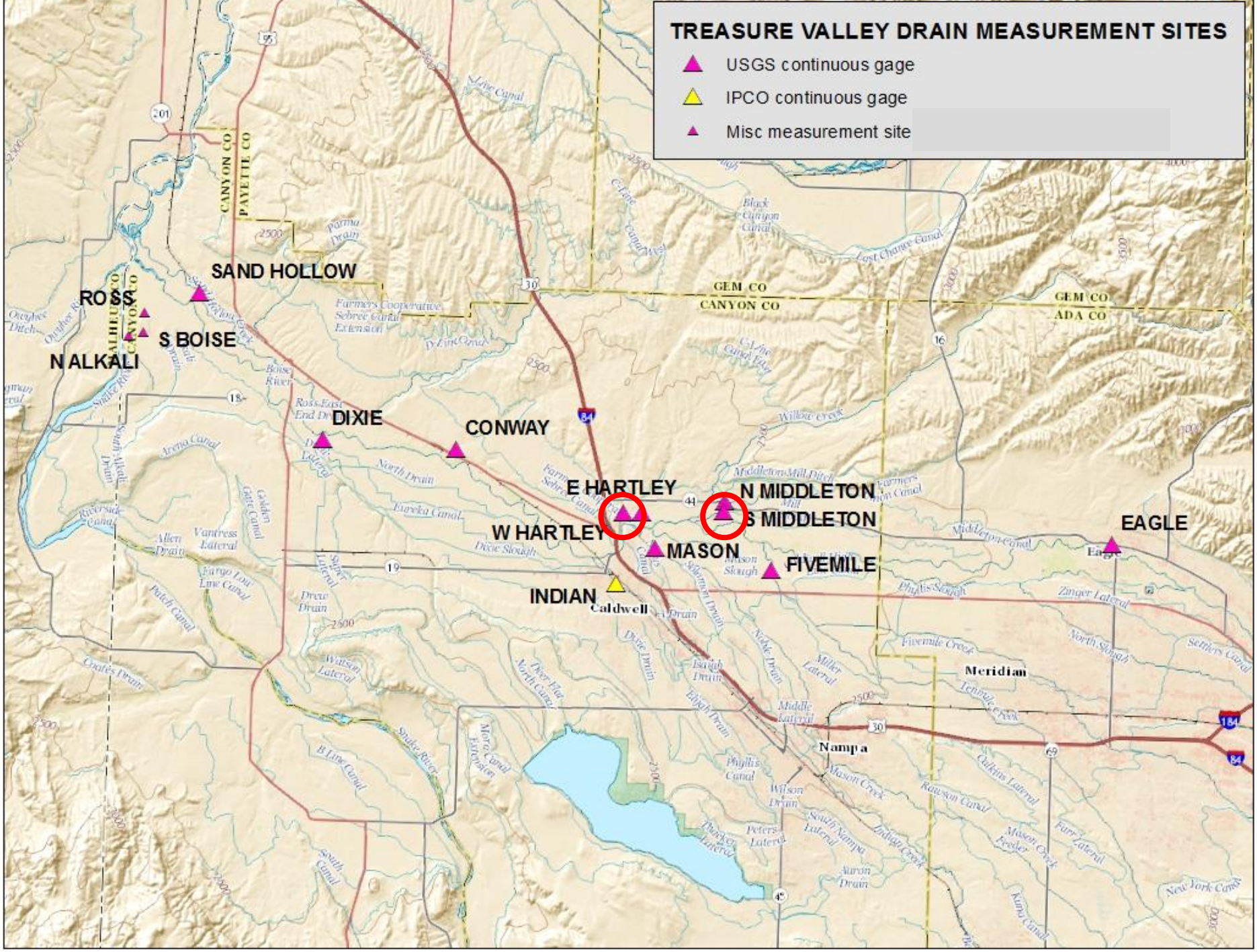
The U.S. Geological Survey (USGS), in partnership with the Idaho Department of Water Resources (IDWR) and Idaho Water Resource Board (IWRB), will construct a numerical groundwater-flow model of the Treasure Valley and surrounding area. Resource managers will use the model to simulate potential anthropogenic and climatic effects on groundwater for water-supply planning and management. As part of model construction, the hydrogeologic understanding of the aquifer system will be updated with information collected during the last two decades, as well as new data collected for the study.

The Treasure Valley

The Treasure Valley is "the agricultural area that stretches west from Boise into Oregon" (U.S. Board on Geographic Names, 2016), although it is commonly referred to as the lower Boise River Basin. The valley contains the three largest and sixth largest cities in Idaho—Boise, Meridian, Nampa, and Caldwell, respectively (fig. 1). The 2016 population of the Treasure Valley was about 630,000, representing about 37 percent of the total population of Idaho (SPF Water Engineering, 2016; U.S. Census Bureau, 2017). Except for

Project scope and schedule

- 5 year project w/ 4 overlapping phases
  - Phase 1 project initiation (complete)
  - Phase 2 data collection/processing (3 components)
    - Hydrologic data collection (USGS & IDWR, ongoing)

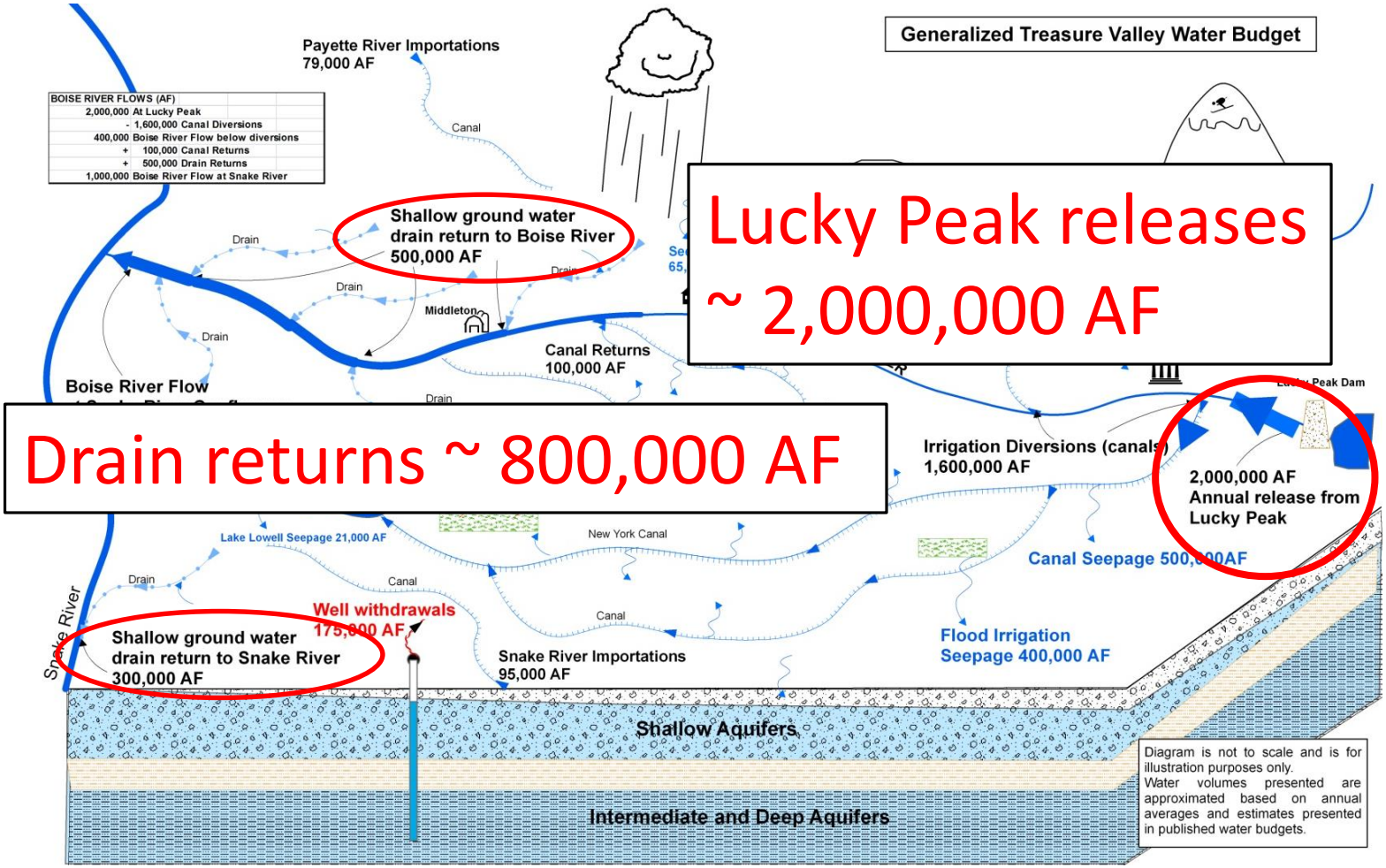

TREASURE VALLEY DRAIN MEASUREMENT SITES
USGS continuous gage
IPCO continuous gage
Misc measurement site
SAND HOLLOW
ROSS
S BOISE
N ALKALI
DIXIE
CONWAY
E HARTLEY
N MIDDLETON
S MIDDLETON
W HARTLEY
MASON
FIVEMILE
EAGLE
INDIAN
Caldwell
Meridian
Nampa
CANYON CO
PAYETTE CO
GEM CO
ADA CO

Agricultural Drains

E. Hartley (winter)

S. Middleton (summer)

Conceptual Water Budget

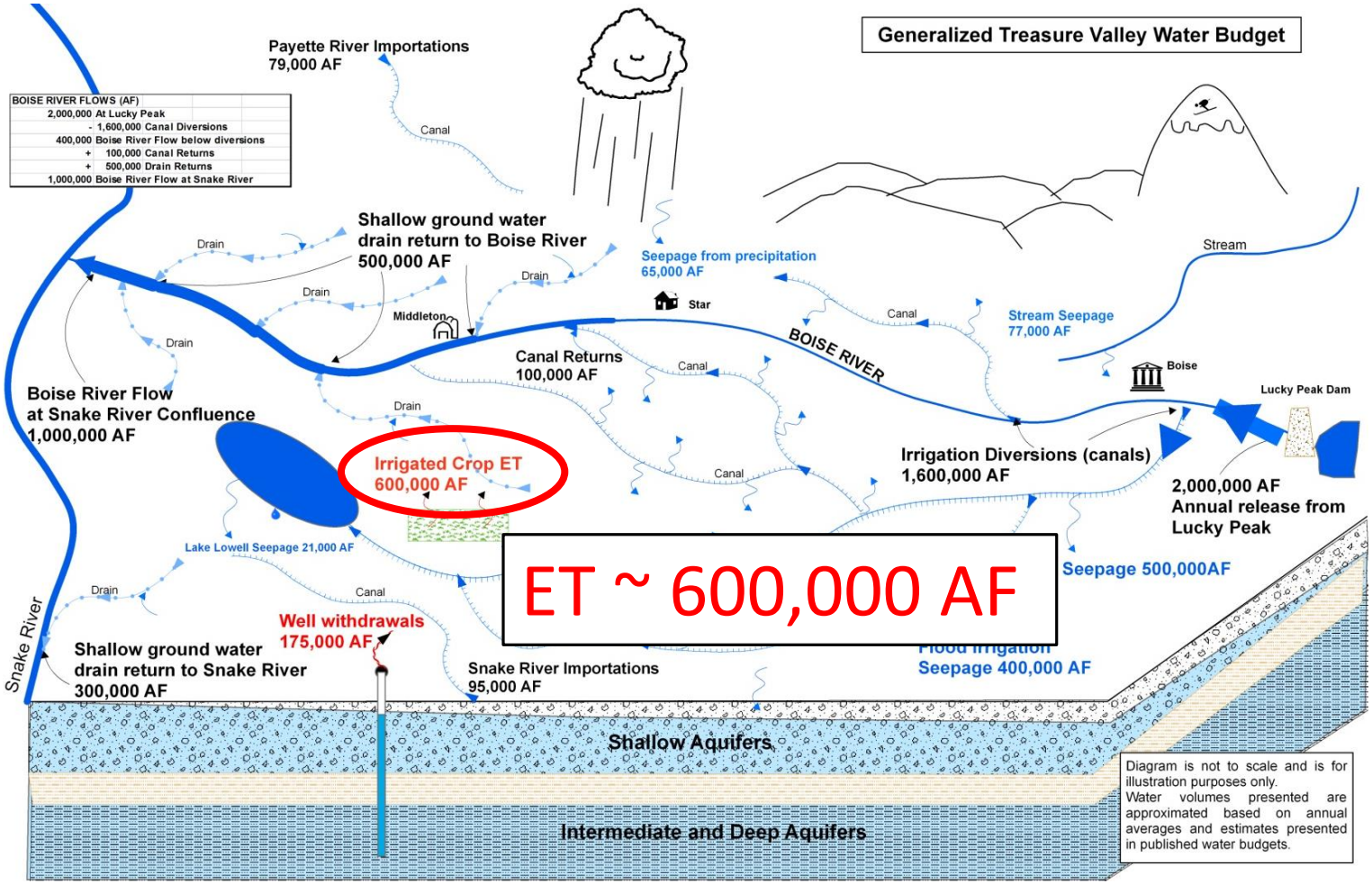


From Urban, 2004

Project scope and schedule

- 5 year project w/ 4 overlapping phases
  - Phase 1 project initiation (complete)
  - Phase 2 data collection/processing (3 components)
    - Hydrologic data collection (USGS & IDWR, ongoing)
    - Evapotranspiration mapping (U of I, ~80% complete)

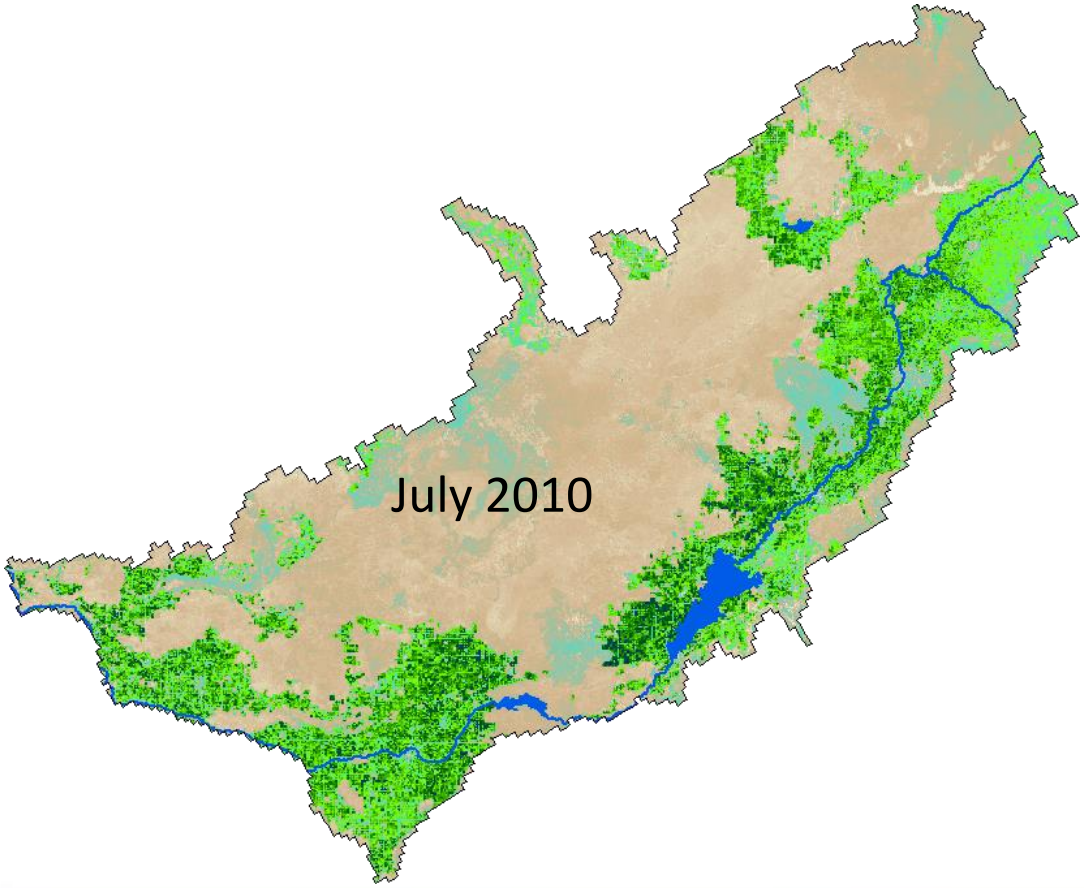
Conceptual Water Budget



From Urban, 2004

METRIC

Mapping Evapotranspiration at High Resolution w/ Internalized Calibration



Energy balance model that computes and maps ET using remote sensing data

Does not require knowledge of the crop distribution

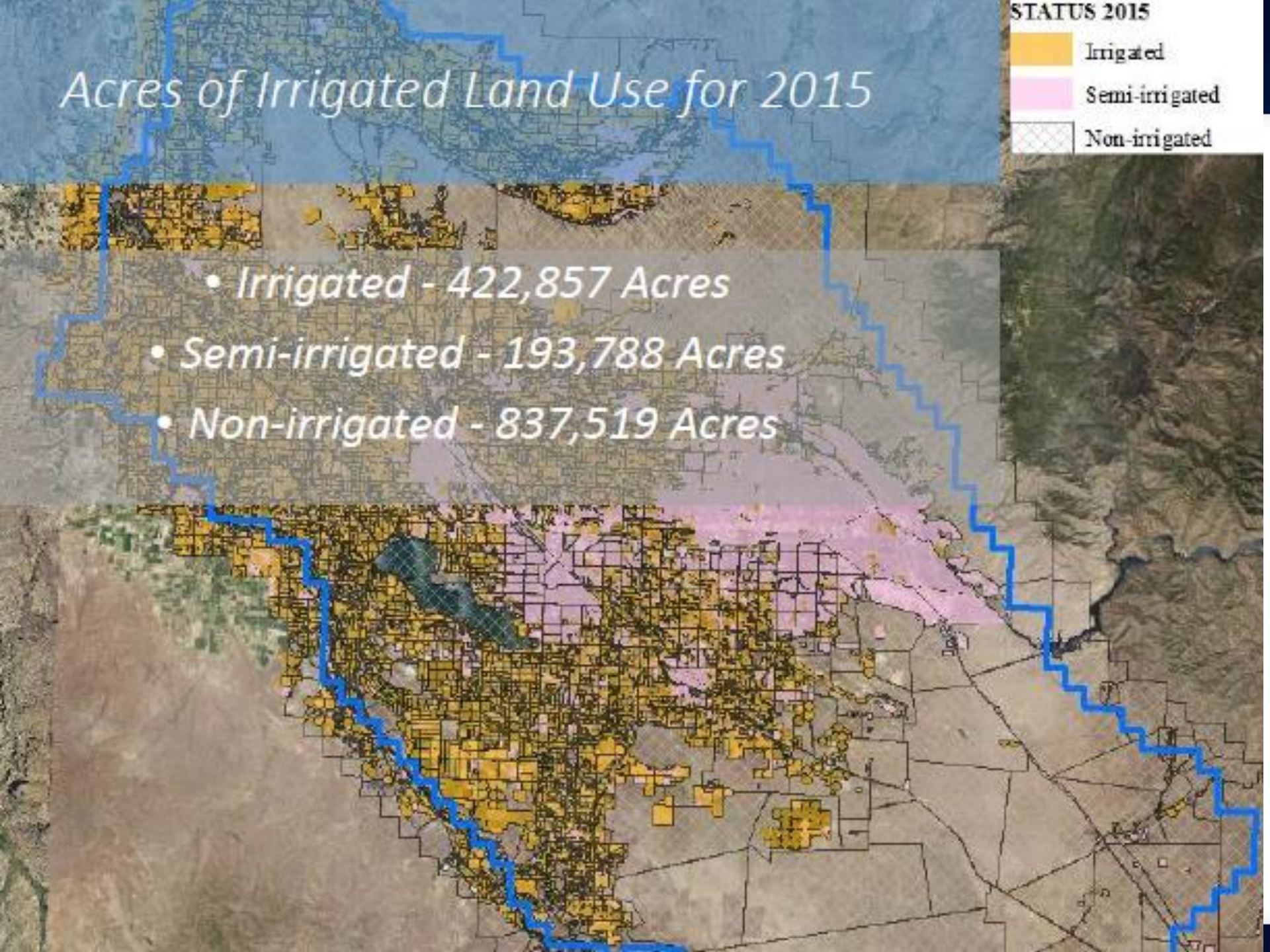
Landsat 8

Project scope and schedule

- 5 year project w/ 4 overlapping phases
  - Phase 1 project initiation (complete)
  - Phase 2 data collection/processing (3 components)
    - Hydrologic data collection (USGS & IDWR, ongoing)
    - Evapotranspiration (ET) mapping (U of I, ~80% complete)
    - Delineation of irrigated lands (IWRRI & IDWR, QC phase)


8 Years of data across a 30 year span to be digitized
1987, 1994, 1997, 2000, 2004, 2007, 2010, 2015

Acres of Irrigated Land Use for 2015



- Irrigated - 422,857 Acres
- Semi-irrigated - 193,788 Acres
- Non-irrigated - 837,519 Acres

Project scope and schedule

- 5 year project w/ 4 overlapping phases
  - Phase 1 project initiation (complete)
  - Phase 2 data collection/processing (2 major components)
    - Hydrologic data collection (ongoing)
    - Evapotranspiration (ET) mapping (U of I, ~80% complete)
    - Delineation of irrigated lands (IWRRI & IDWR, QC phase)
  - Phase 3 hydrogeologic framework (complete)

USGS
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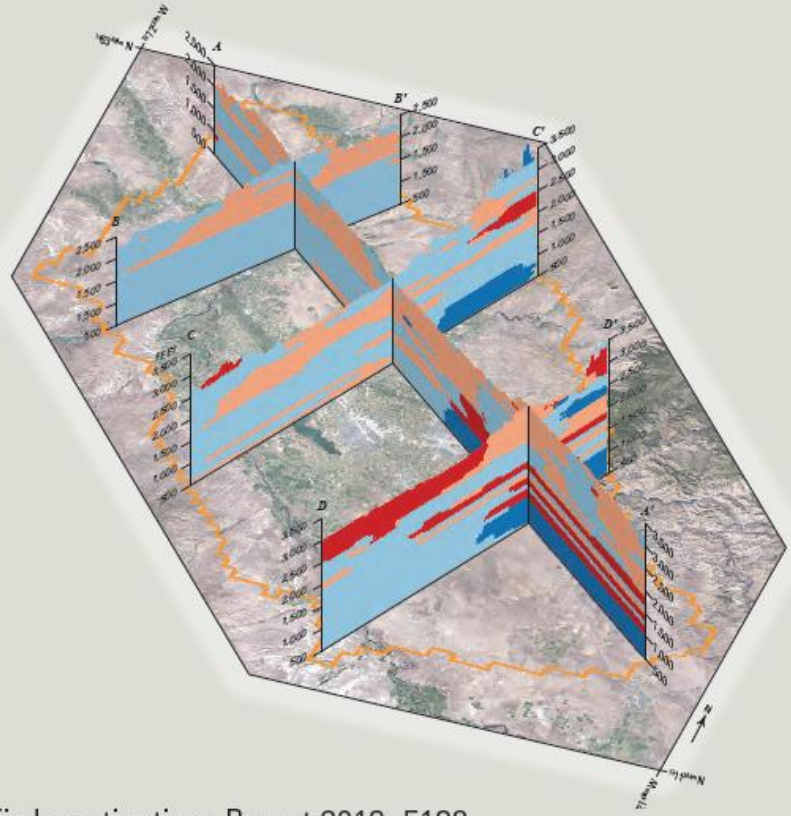
Prepared in cooperation with the Idaho Water Resource Board and the Idaho Department of Water Resources

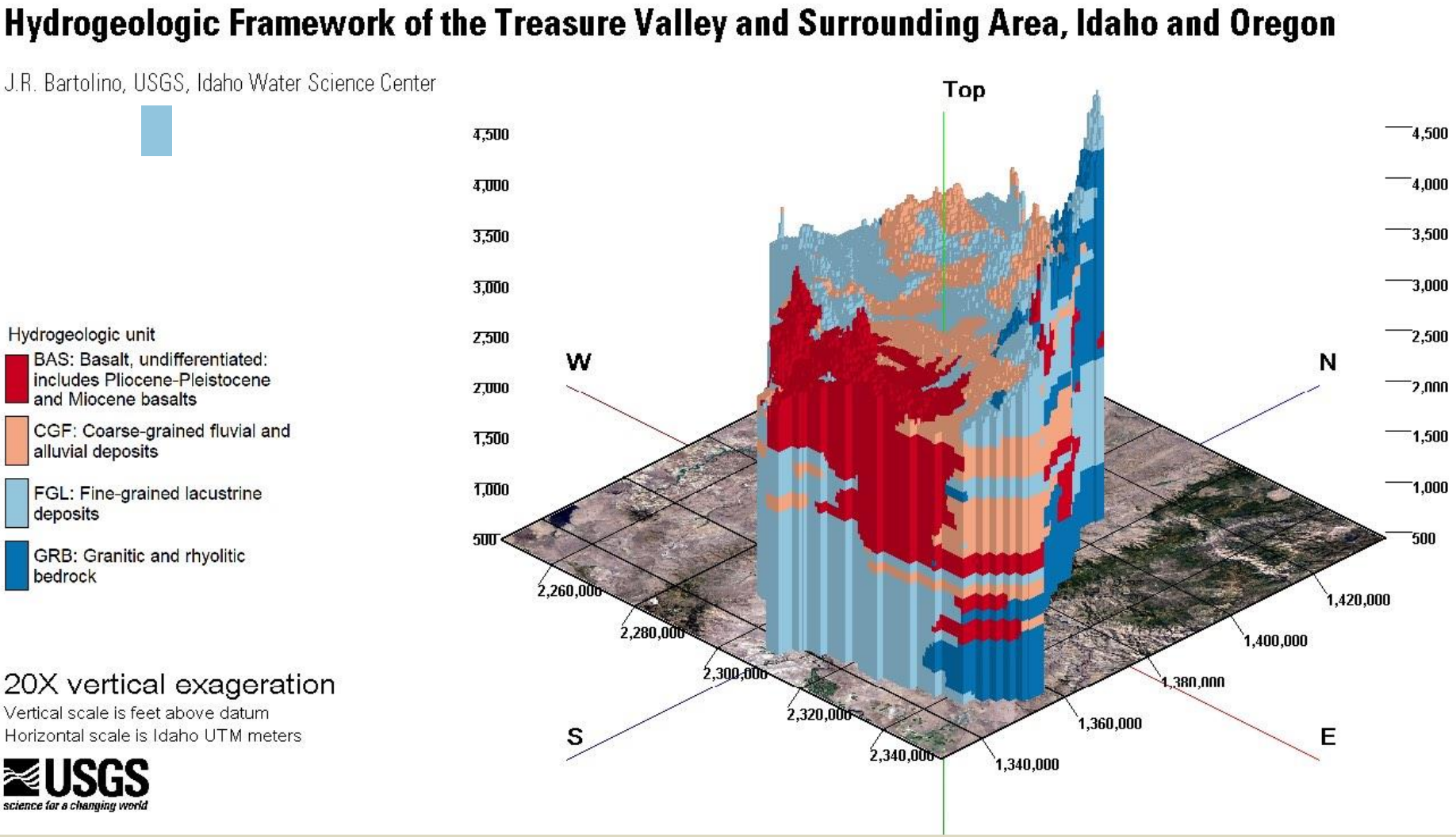
Hydrogeologic Framework of the Treasure Valley and Surrounding Area, Idaho and Oregon



Scientific Investigations Report 2019–5138

U.S. Department of the Interior
U.S. Geological Survey

Rockworks Geologic Model (1,800 Driller's Logs)



Geologic Complexity

"The Treasure Valley region of southwestern Idaho has a complex history of lacustrine and alluvial deposition that influences regional ground water movement. In general, basin sedimentary deposits grade from coarser, more permeable sediments near the Boise Front to finer, less permeable sediments at the distal end of the basin…These regional trends are interrupted by a complex arrangement of highly permeable deposits associated with paleo-river channels, river deltas, alluvial fans, and other features characteristic of a dynamic lacustrine history. Productive units are often surrounded by lower permeability deep-lake deposits, which, in some cases, limit interaction between productive units. The complexity of the ground water environment is well documented…

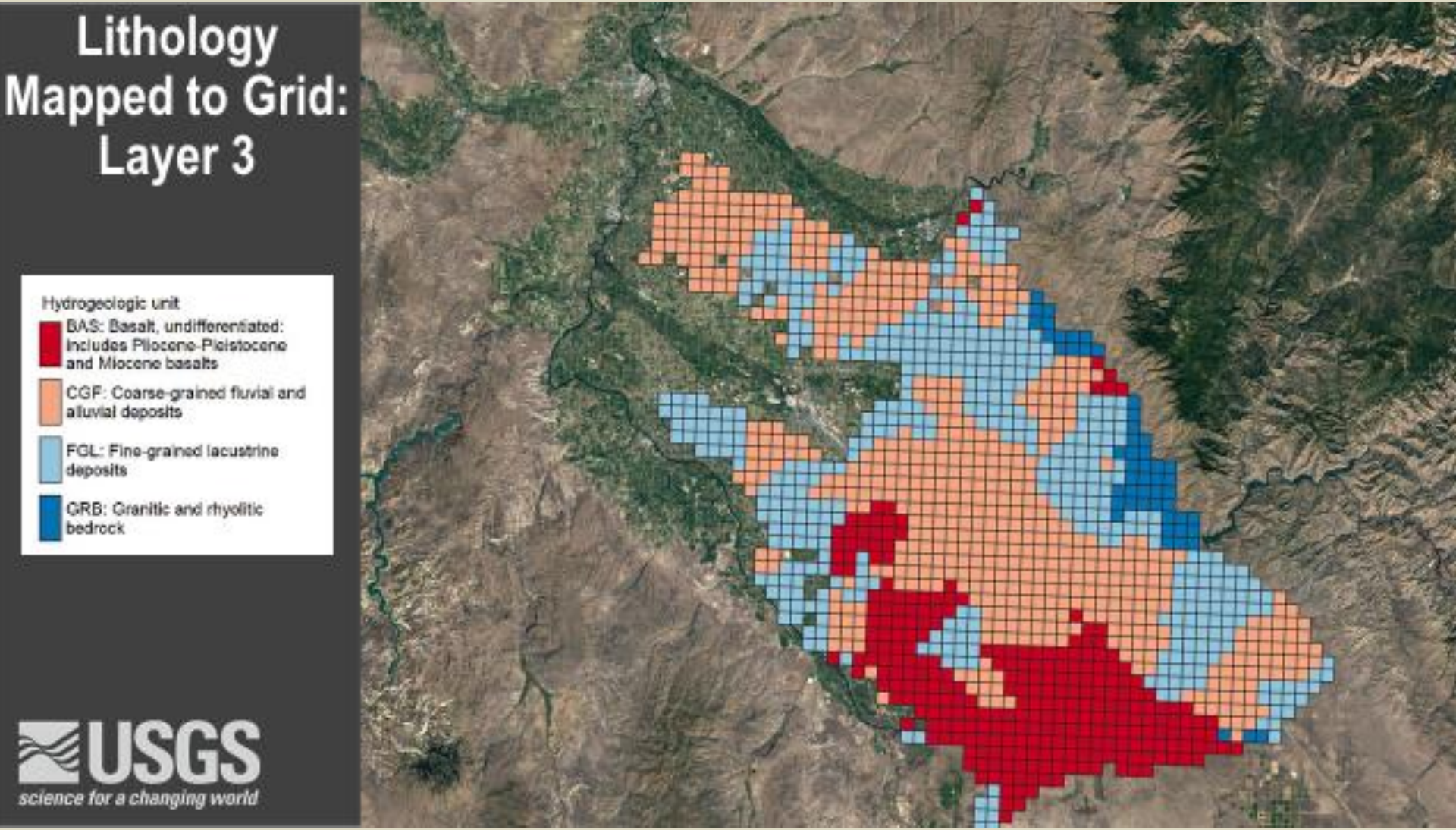
…Basin downwarping and an associated downslope trend in sediment deposition contribute to steeply dipping sedimentary deposits along the northern basin margin, which may cause deeper aquifer units to pinch out at depth (Wood, 1997). An erosional unconformity associated with changing lake levels in Pliocene Lake Idaho truncates down-dipping units along the basin margin near Boise (Wood, 1997; Squires et al., 1992). The relationship between ground water above the unconformity and ground water in the underlying delta deposits, while unclear, is thought to be significant … In addition to complexity inherent in deposition and erosion, a series of major faults bisect the stratigraphic section along the northern basin margin. The hydrologic impact of these faults is poorly understood, but they are likely to be an important influence on ground water flow in Boise-area aquifers." (emphasis added, Hutchings and Petrich, 2002)

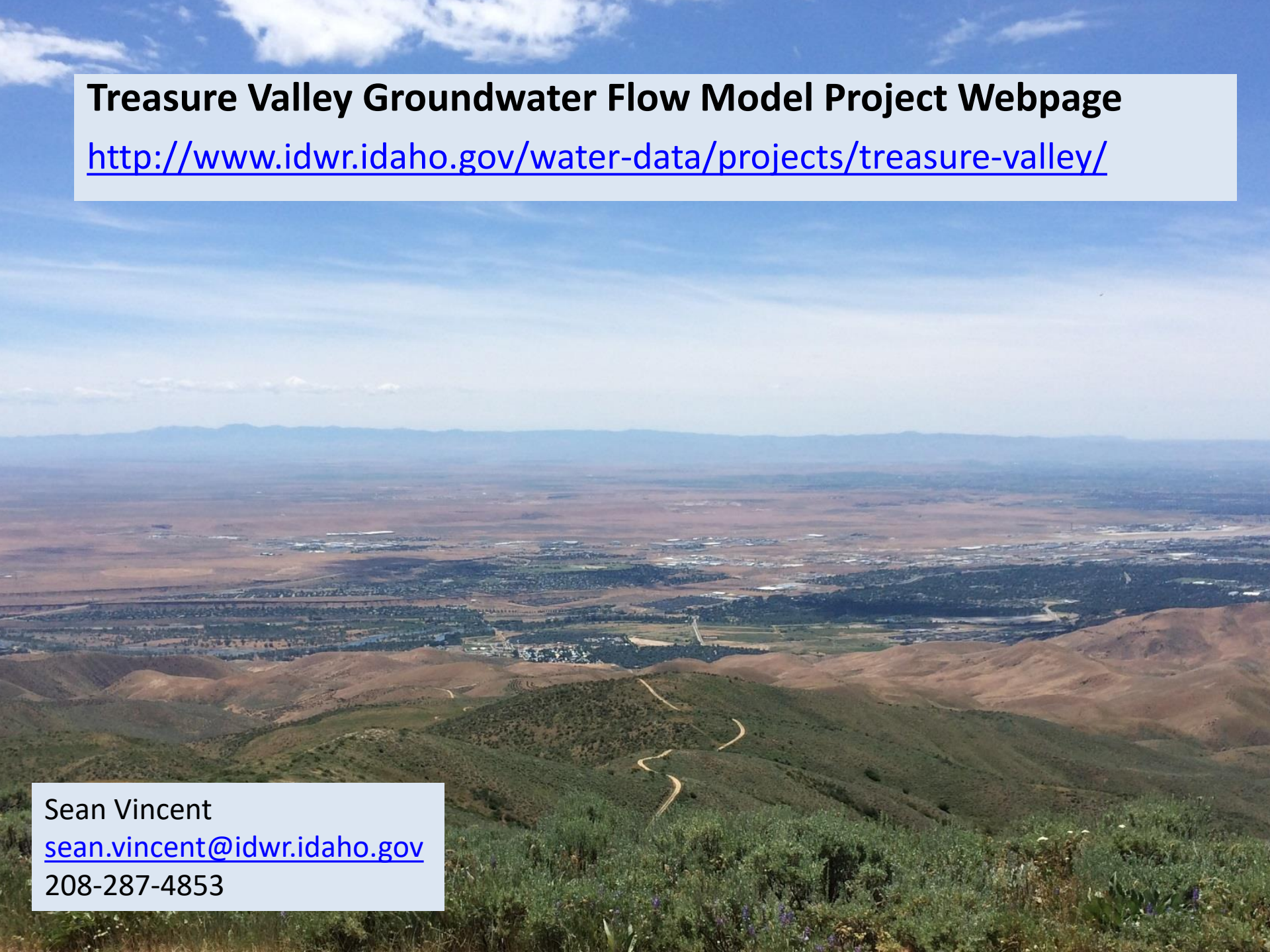
Project scope and schedule

- 5 year project w/ 4 overlapping phases
  - Phase 1 project initiation (complete)
  - Phase 2 data collection/processing
    - Hydrologic data collection (USGS & IDWR, ongoing)
    - Evapotranspiration (ET) mapping (U of I, ~80% complete)
    - Delineation of irrigated lands (IWRRI & IDWR, QC phase)
  - Phase 3 hydrogeologic framework (complete)
  - Phase 4 model development (through December 2021)

Model Development

Initial 6-layer model based on combination of geology and vertical water level gradients





Treasure Valley Groundwater Flow Model Project Webpage

http://www.idwr.idaho.gov/water-data/projects/treasure-valley/

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