



# 2022 Potentiometric Surfaces and Groundwater-Level Changes in the Big Lost River Valley

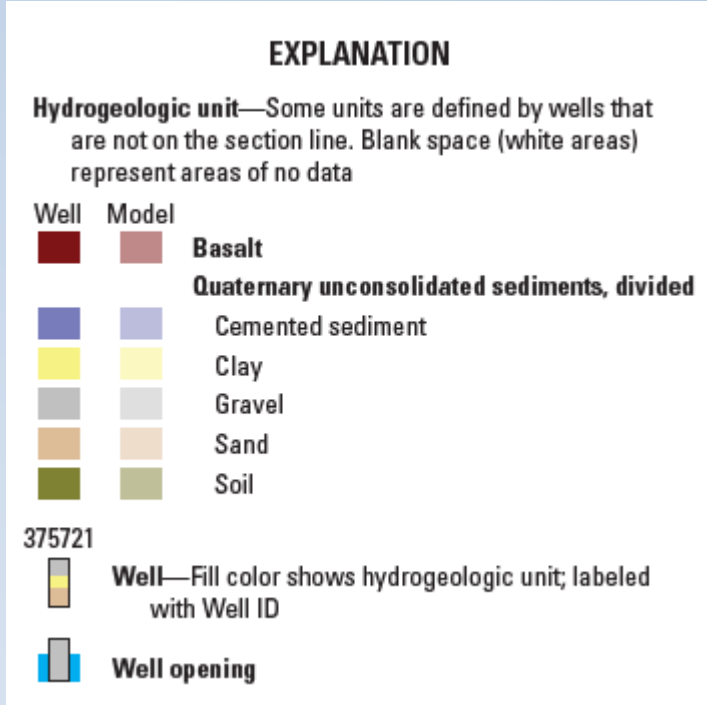
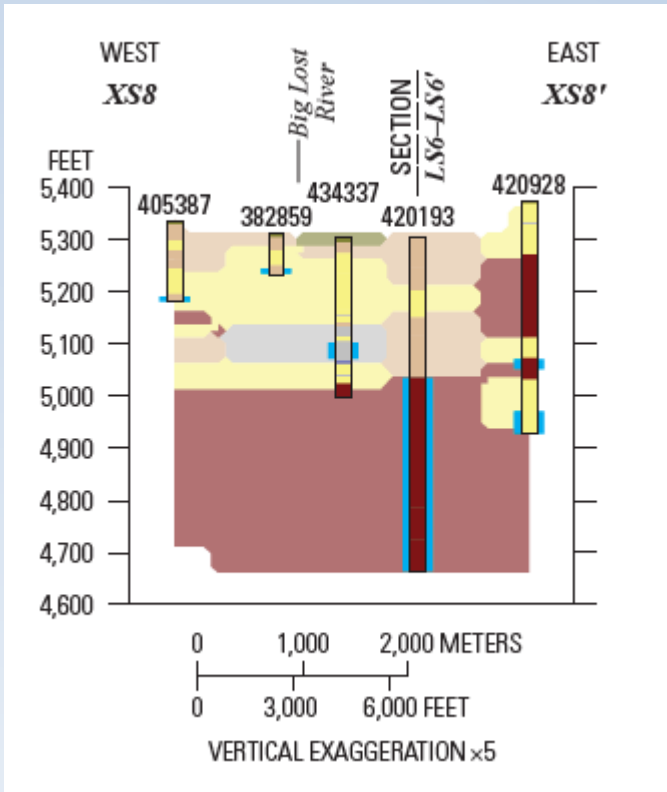


U.S. Department of the Interior  
U.S. Geological Survey

In cooperation with the  
Idaho Department of Water Resources

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# Motivation

- Recognized data gap
- Last detailed potentiometric surfaces developed for 1968 (whole valley) and 1991 (southern half)
- Complexity in water-bearing units in southern end of the basin

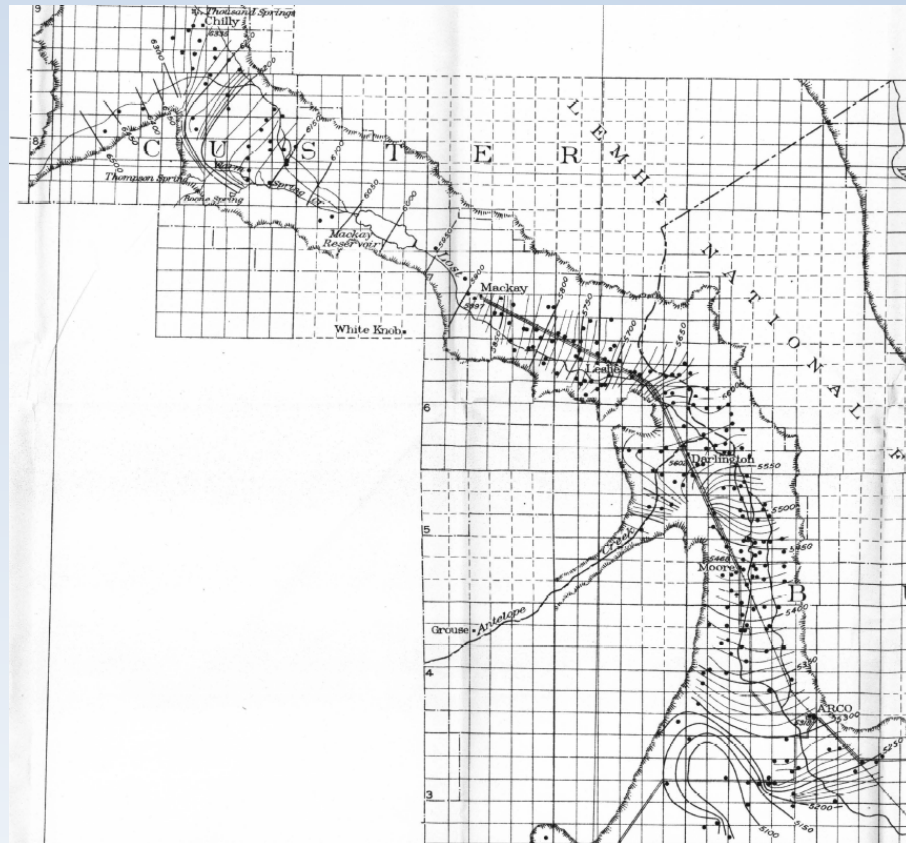
# Goals

- Improve hydrogeologic understanding
- Support groundwater modeling
- Inform water rights administration



# Previous Groundwater-Level Synoptics

Stearns and others, 1938



Bassick and Jones, 1992



Crosthwaite and others, 1970a

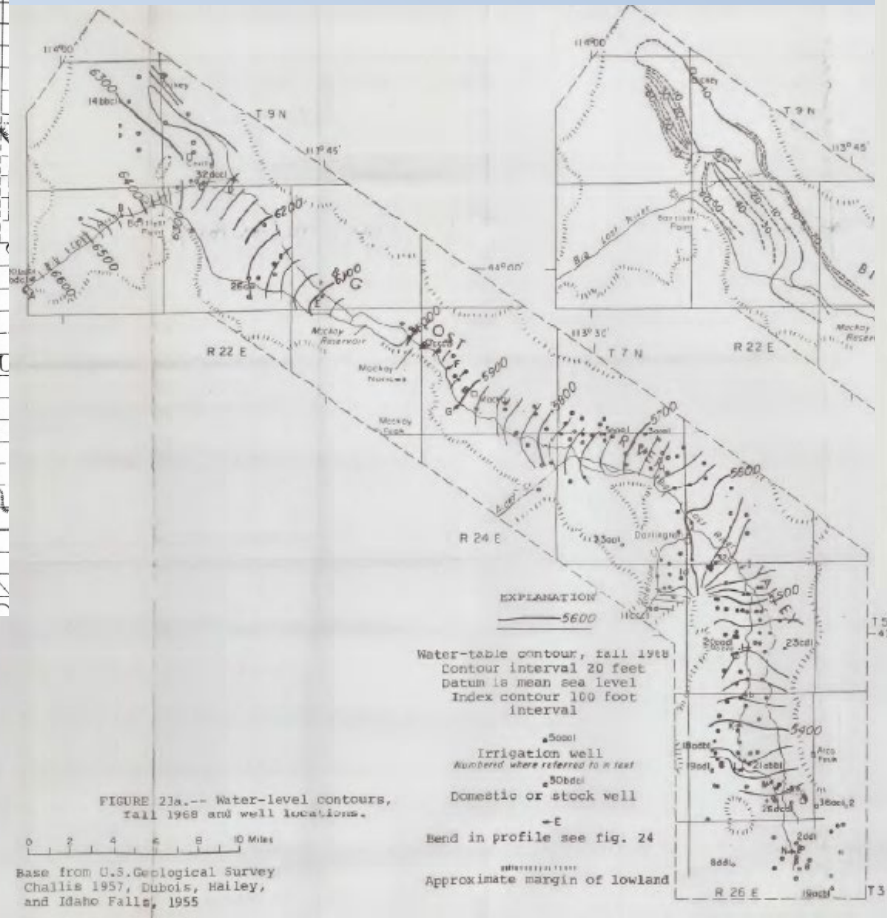


FIGURE 23a.-- Water-level contours, Fall 1968 and well locations.

Base from U.S. Geological Survey  
Challis 1957, Dubois, Hailey,  
and Idaho Falls, 1955

Water-table contour, Fall 1968  
Contour interval 20 feet  
Datum is mean sea level  
Index contour 100 foot  
interval

● 5000  
Irrigation well  
Numbered where referred to in text

● 5000  
Domestic or stock well

→ E  
Bend in profile see fig. 24

-----  
Approximate margin of lowland

# Approach

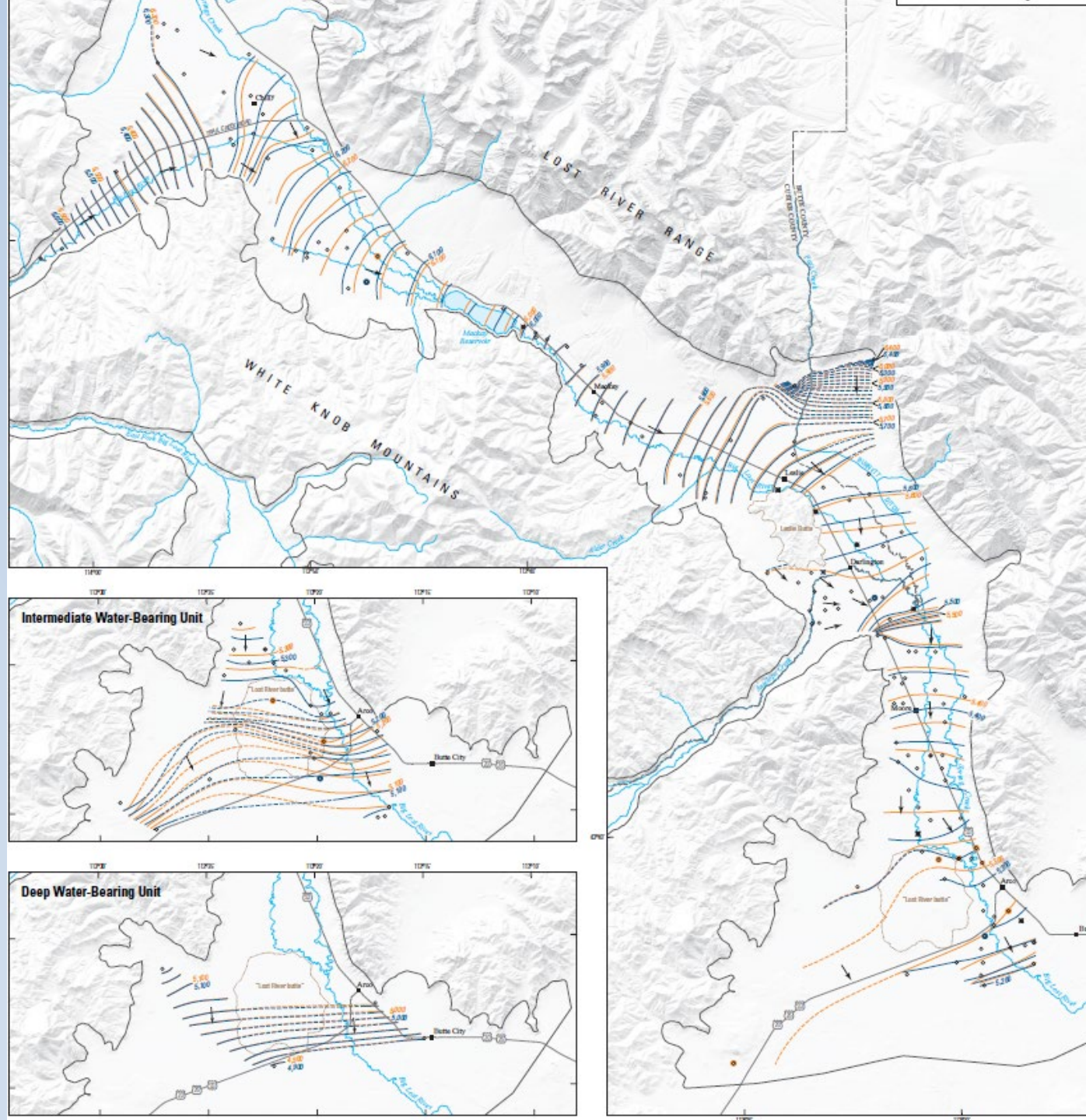
- Measured water levels in 180 wells (49 IDWR/131 USGS)
  - Surveyed wellheads
  - Prioritized previously measured wells
- Two events:
  - Pre (early April 2022) and
  - Post (early November 2022) irrigation season
- Develop potentiometric surface maps
  - Kriging and then hand-modified
- Develop change maps
  - Only in paired wells (1968, 1991, 2022)



# Potentiometric Surfaces

Published in Ducar and Zinsser, 2023

- Map and pamphlet:  
<https://doi.org/10.3133/sim3509>
- Data release:  
<https://doi.org/10.5066/P93NQAP9>
  
- Broadly similar to past surfaces
- 3 water-bearing units identified in the southern end based on:
  - Well depth
  - Water-level elevation
  - Hydrogeologic unit



# Potentiometric Surfaces

Published in Ducar and Zinsser, 2023

- **Map and pamphlet:**  
<https://doi.org/10.3133/sim3509>
- **Data release:**  
<https://doi.org/10.5066/P93NQAP9>

The screenshot shows a Bing search interface. The search bar contains the text "big lost potentiometric". Below the search bar, there are navigation options: SEARCH, COPILOT, VIDEOS, IMAGES, MAPS, NEWS, and SHOPPING. The search results section shows "Bing found these results" with a result from USGS.gov. The result title is "Groundwater potentiometric-surface altitude in 2022 and ..." and the snippet mentions "The U.S. Geological Survey and the Idaho Department of Water Resources measured groundwater levels during spring 2022 and autumn 2022 to create detailed potentiometric-surface maps for the alluvial aquifer in the Big Lost River Valley in south ...". There are also tags for "Water Resources", "Water Maps", and "Us Geological Survey Water Levels".



The screenshot shows the USGS publication page. The URL is "https://pubs.usgs.gov/publication/sim3509". The page header includes the USGS logo and the tagline "science for a changing world". The main title is "Groundwater Potentiometric-Surface Altitude in 2022 and Groundwater-Level Changes Between 1968, 1991, and 2022, in the Alluvial Aquifer in the Big Lost River Valley, South-Central Idaho". Below the title, it says "Scientific Investigations Map 3509" and "Prepared in cooperation with the Idaho Department of Water Resources". The authors are listed as "By: Scott D. Ducar and Lauren M. Zinsser". A DOI link is provided: "https://doi.org/10.3133/sim3509". There is a circular icon with the number "2" in the top right corner. The "Links" section includes: Document: Sheet (2.9 MB pdf), HTML, XML; Additional Report Piece: Pamphlet (3.3 MB pdf); Data Release: USGS data release — Groundwater potentiometric-surface contours and well numbers used to map groundwater potentiometric-surface altitude in 2022 and groundwater-level changes between 1968, 1991, and 2022 in the alluvial aquifer in the Big Lost River Valley, south-central Idaho; Download citation as: RIS | Dublin Core. The "Abstract" section starts with "The U.S. Geological Survey and the Idaho Department of Water Resources measured groundwater levels during spring 2022 and autumn 2022 to create detailed potentiometric-surface maps for the alluvial aquifer in the Big Lost River Valley in south-central Idaho. Wells were assigned to shallow, intermediate, and deep water-bearing units based on well depth, groundwater potentiometric-surface altitude, and hydrogeologic unit. Potentiometric-surface contours were created for each of the three water-bearing units for spring 2022 and autumn 2022. Groundwater flow generally follows topography down valley to the south. The groundwater-level data also were used to calculate changes in groundwater levels from spring to autumn 2022 and from historical measurement events in 1968 and 1991 to 2022. Groundwater levels declined at most wells from spring 1968 to spring 2022 and from spring 1991 to spring 2022. Although groundwater-level changes are sensitive to interannual wet and dry periods, long-term groundwater-level declines suggest that recharge and down-valley groundwater flows are insufficient to fully recover groundwater-level declines from pumping in some parts of the alluvial aquifer in the Big Lost River Valley." A box on the right side of the abstract contains the text: "First posted September 27, 2023" and "For additional information, contact: Director, Idaho Water Science Center, U.S. Geological Survey, 230 Collins Road, Boise, Idaho 83702-4520".

# Potentiometric Surfaces

Published in Ducar and Zinsser, 2023

- Map and pamphlet:  
<https://doi.org/10.3133/sim3509>
- Data release:  
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USGS ScienceBase-Catalog Communities Help

ScienceBase Catalog → USGS Idaho W... → Groundwater p...

## Groundwater potentiometric-surface contours and well numbers used to map groundwater potentiometric-surface altitude in 2022 and groundwater-level changes between 1968, 1991, and 2022 in the alluvial aquifer in the Big Lost River Valley, south-central Idaho

Prepared in cooperation with the Idaho Department of Water Resources

View

### Dates

Publication Date : 2023-09-27  
Start : 1968-03-28  
End : 2022-11-04

### Citation

Ducar, S.D., and Zinsser, L.M., 2023, Groundwater potentiometric-surface contours and well numbers used to map groundwater potentiometric-surface altitude in 2022 and groundwater-level changes between 1968, 1991, and 2022 in the alluvial aquifer in the Big Lost River Valley, south-central Idaho: U.S. Geological Survey data release, <https://doi.org/10.5066/P93NQAP9>.

### Summary

Groundwater potentiometric-surface contours for spring 2022 (April 4 to 8, 2022) and autumn 2022 (October 30 to November 4, 2022) were created for the alluvial aquifer in Big Lost River Valley. The well numbers and station names used to create the potentiometric-surface contours and groundwater-level change maps are provided in this data release. The location, depth to water, and potentiometric-surface altitude for these wells can be accessed on USGS National Water Information System (NWIS) or Idaho Department of Water Resources (IDWR) groundwater portal. The interpreted 20-foot contours of the potentiometric-surface are also provided in this data release. The contours are referenced to the North American Vertical Datum of 1988 (NAVD 88). The potentiometric-surface contours are divided into three water-bearing units - shallow, intermediate, and deep - based on well depth, potentiometric-surface altitude, and hydrogeologic unit. The intermediate and deep units were only identified in the southern portion of the valley near Arco, Idaho. The potentiometric-surface contours ranged from 4,900 to 6,660 feet above NAVD 88. The groundwater-level change at well sites from spring to autumn 2022, spring to autumn 1968, spring 1968 to spring 2022, spring 1991 to spring 2022, and spring 1968 to spring 1991 were calculated and are provided in a shapefile.

### Contacts

Point of Contact : Scott D Ducar  
Originator : Scott D Ducar, Lauren M Zinsser  
Metadata Contact : Scott D Ducar  
Publisher : U.S. Geological Survey  
Distributor : U.S. Geological Survey - ScienceBase  
SDC Data Owner : Idaho Water Science Center  
USGS Mission Area : Water Resources

### Attached Files

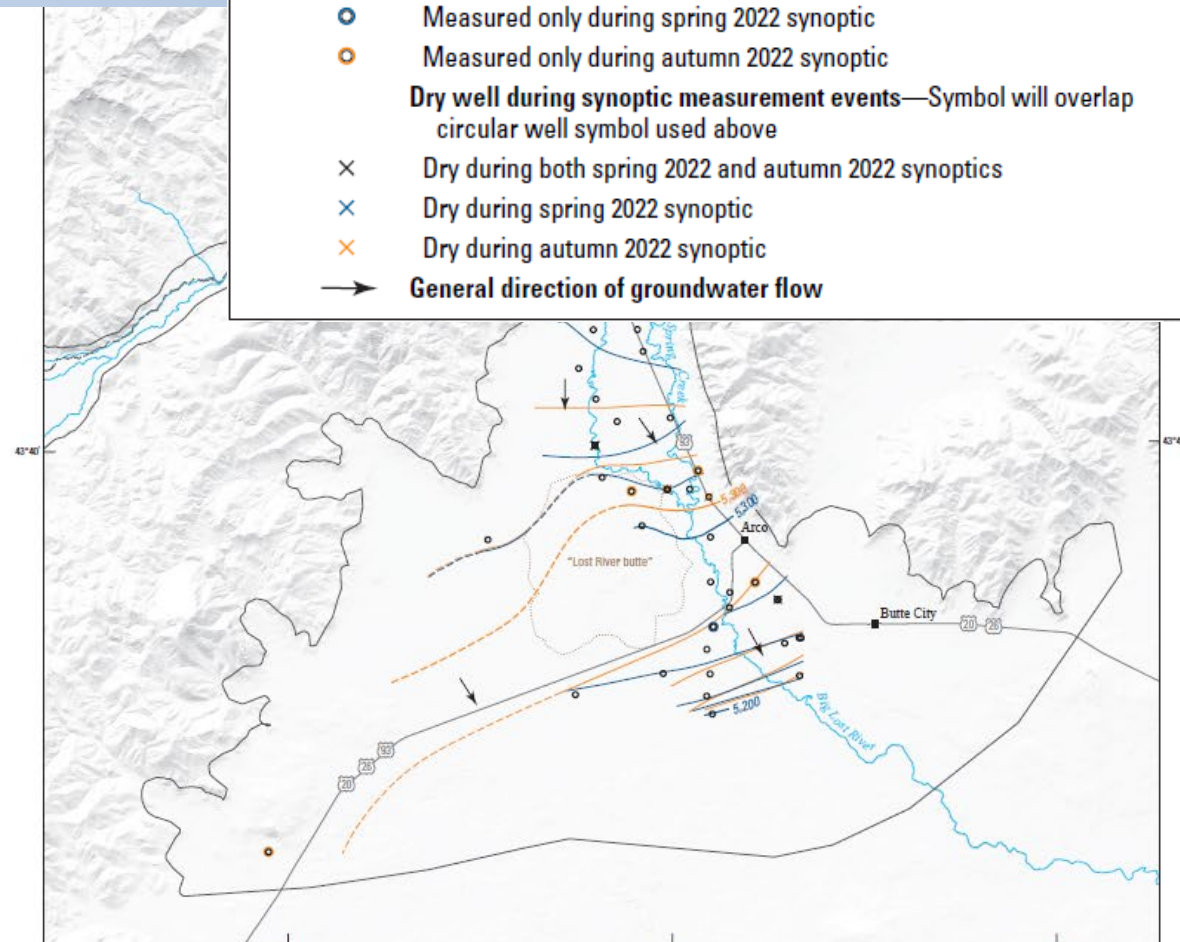
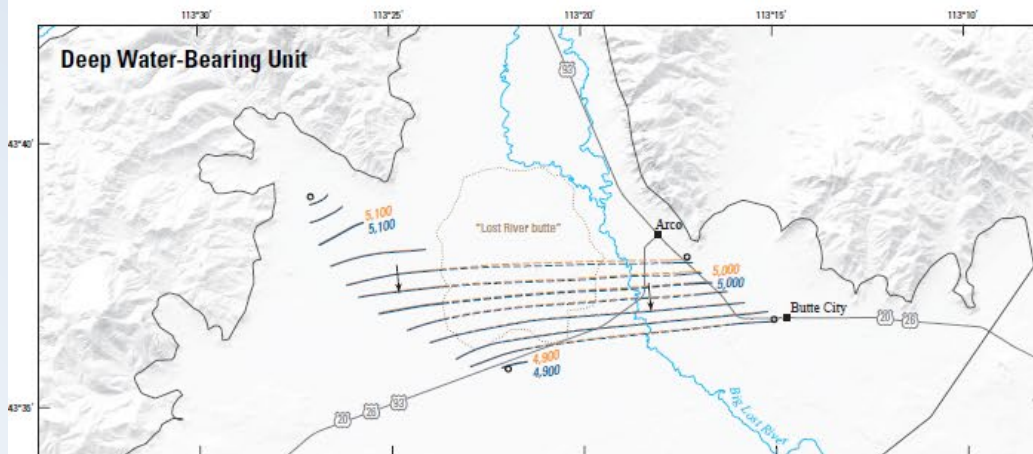
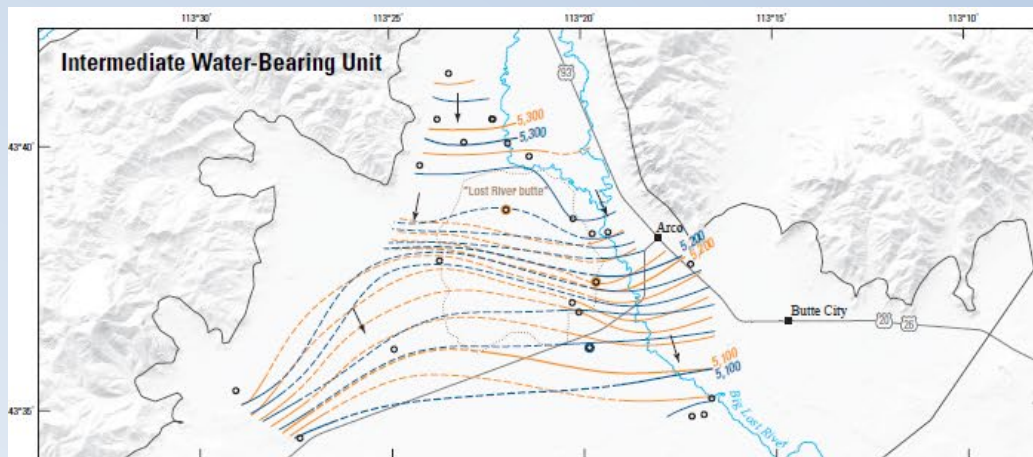
Click on title to download individual files attached to this item or [download all files](#) listed below as a compressed file.

<a href="#">BLR_potentiometric_surfaces_data_release.xml</a> <i>Original FGDC Metadata</i>	<a href="#">View</a>	45.05 KB	application/fgdc+xml
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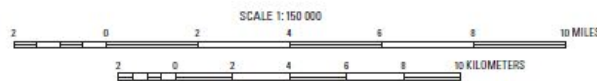
# Potentiometric Surfaces – Southern End of Valley

## EXPLANATION

- Alluvial aquifer boundary
- Potentiometric contour—Dashed where approximately located. Contour interval 20 feet. Datum is North American Vertical Datum of 1988
- 5,300 — Spring 2022
- 5,300 — Autumn 2022
- Well measured during synoptic measurement events
  - Measured during both spring 2022 and autumn 2022 synoptics
  - Measured only during spring 2022 synoptic
  - ◉ Measured only during autumn 2022 synoptic
- Dry well during synoptic measurement events—Symbol will overlap circular well symbol used above
  - × Dry during both spring 2022 and autumn 2022 synoptics
  - × Dry during spring 2022 synoptic
  - × Dry during autumn 2022 synoptic
- General direction of groundwater flow



Shaded relief, roads, and boundaries from U.S. Geological Survey digital data, various scales; hydrography modified from Idaho Department of Water Resources 1:250,000-scale digital data Idaho Transverse Mercator projected coordinate system North American Datum of 1982



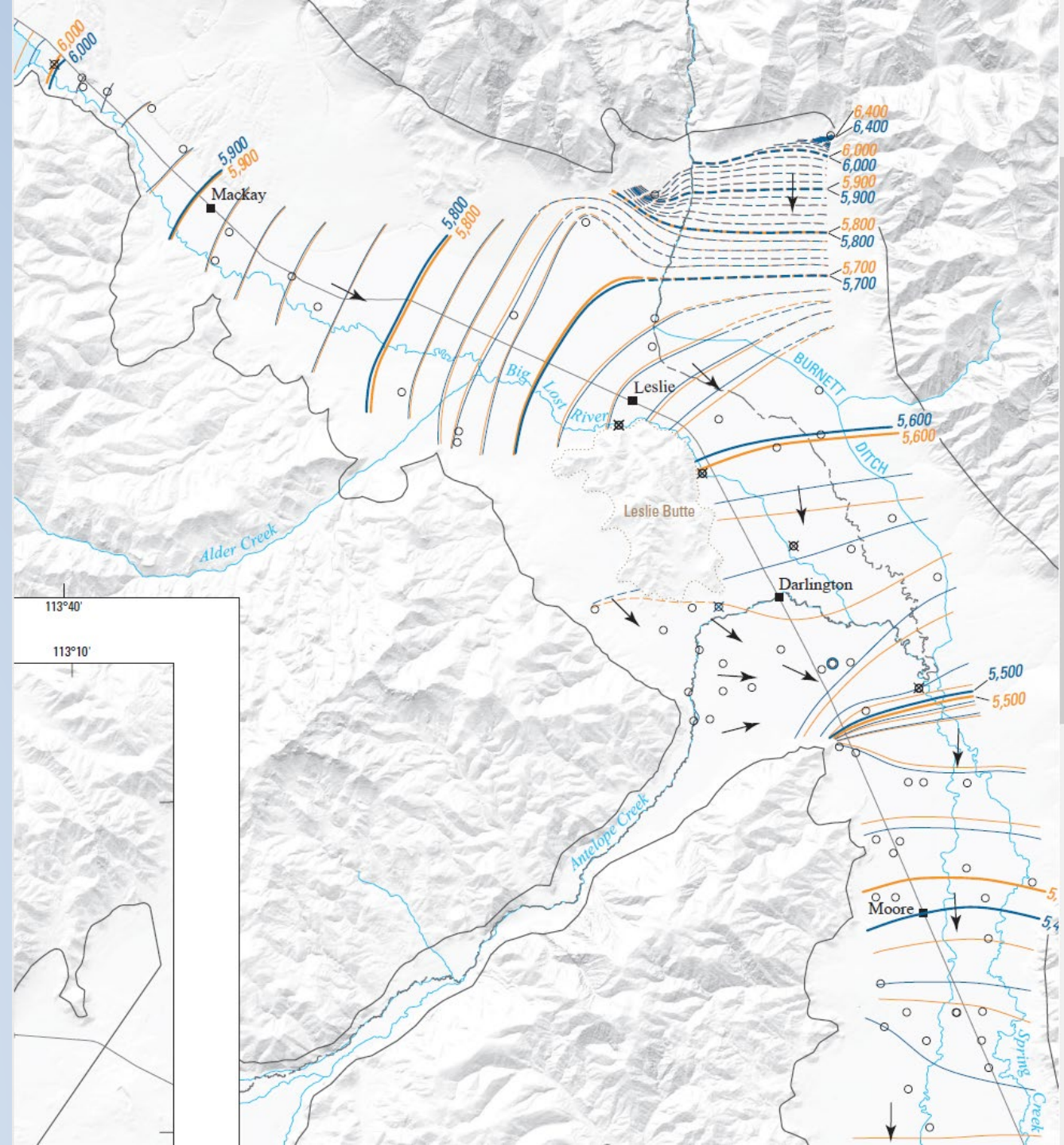
Digital cartographic production by Joseph F. Manganò; edited by Nathan A. Severance  
Manuscript approved for publication September 3, 2022



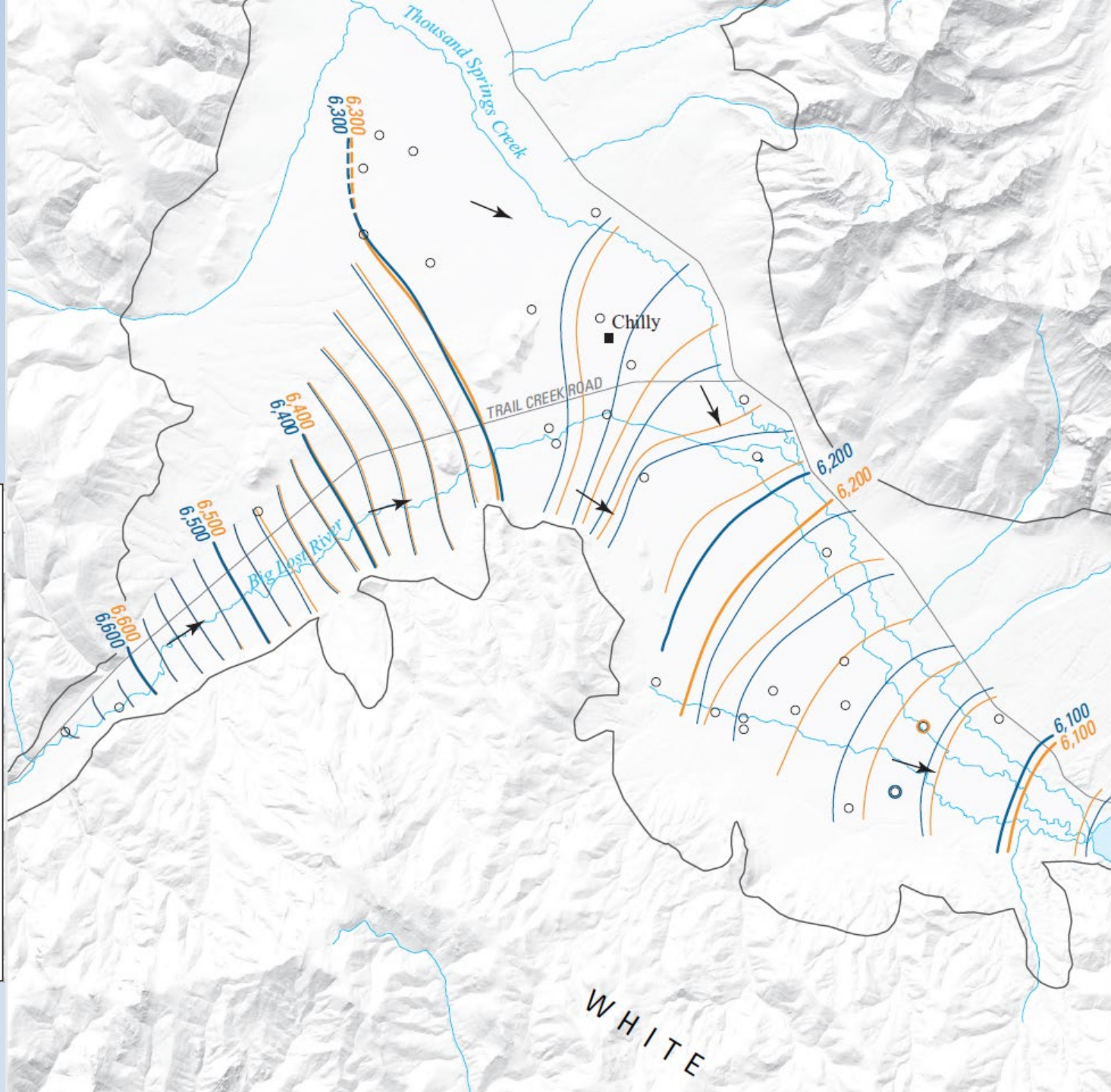
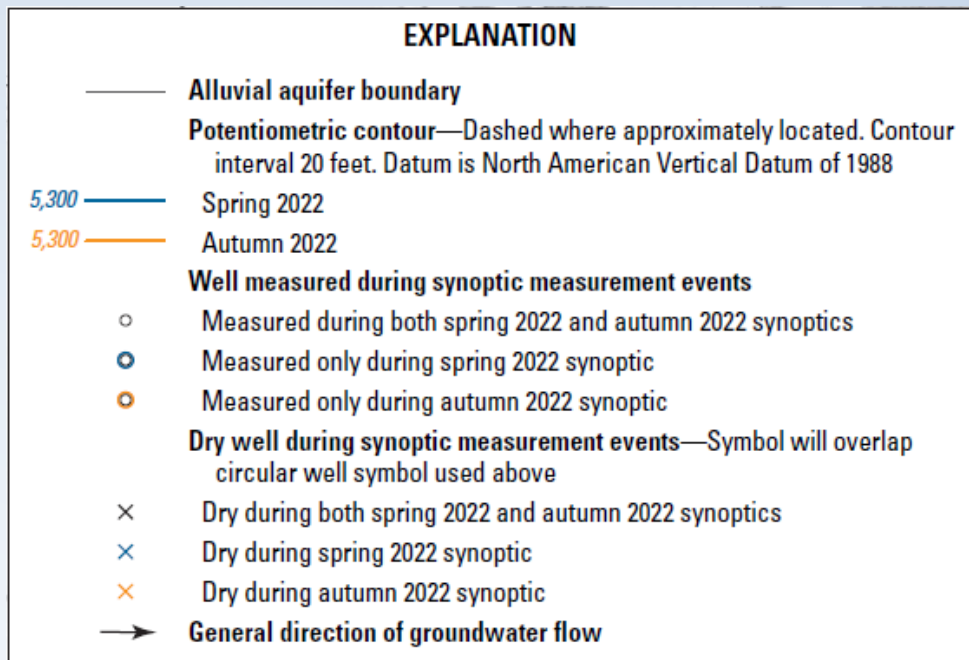
# Potentiometric Surfaces: Middle

## EXPLANATION

- Alluvial aquifer boundary
- Potentiometric contour—Dashed where approximately located. Contour interval 20 feet. Datum is North American Vertical Datum of 1988
- 5,300 — Spring 2022
- 5,300 — Autumn 2022
- Well measured during synoptic measurement events
  - Measured during both spring 2022 and autumn 2022 synoptics
  - ⊙ Measured only during spring 2022 synoptic
  - ⦿ Measured only during autumn 2022 synoptic
- Dry well during synoptic measurement events—Symbol will overlap circular well symbol used above
  - × Dry during both spring 2022 and autumn 2022 synoptics
  - ⊗ Dry during spring 2022 synoptic
  - ⊗ Dry during autumn 2022 synoptic
- ➔ General direction of groundwater flow

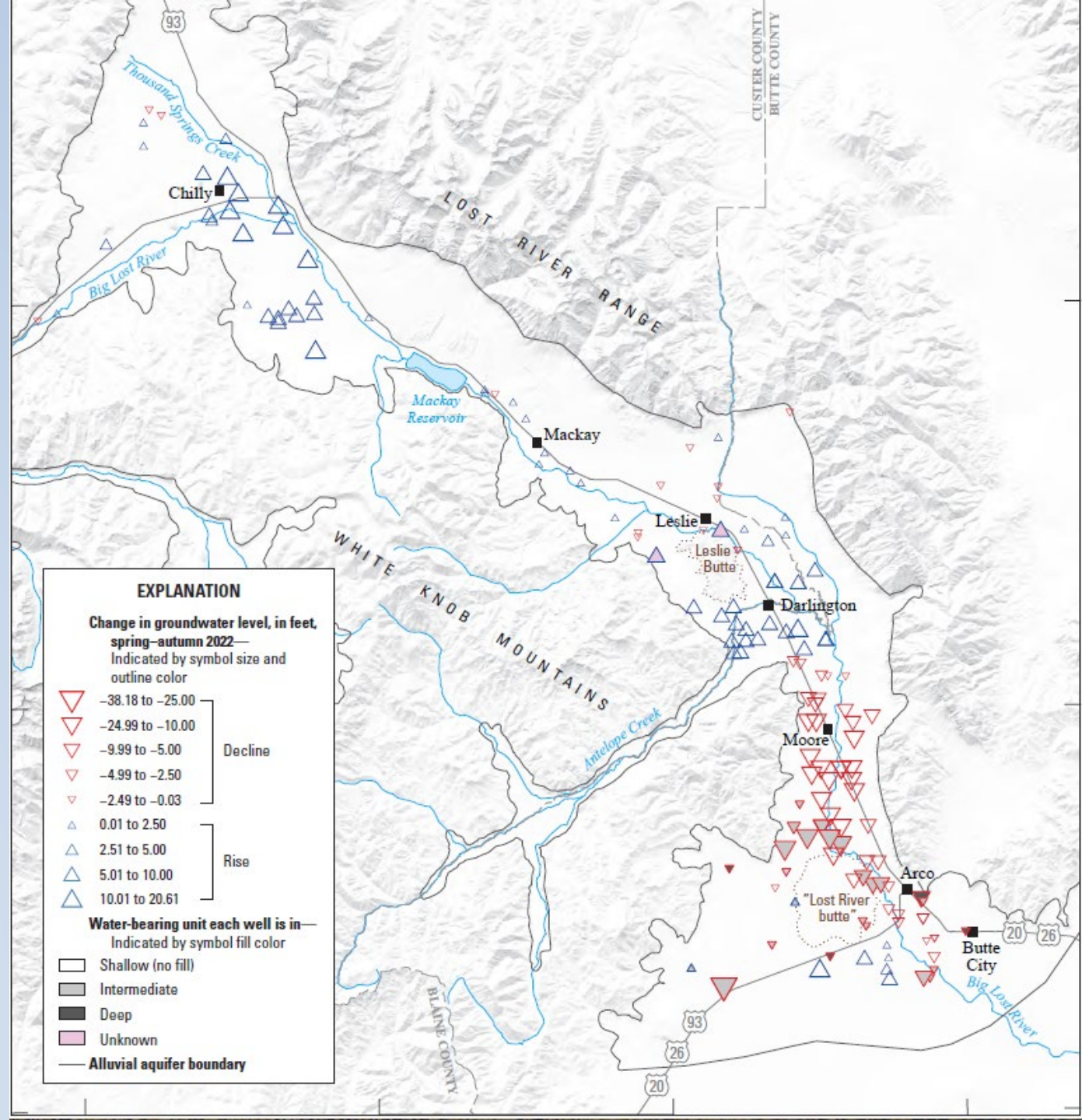


# Potentiometric Surfaces: Northern



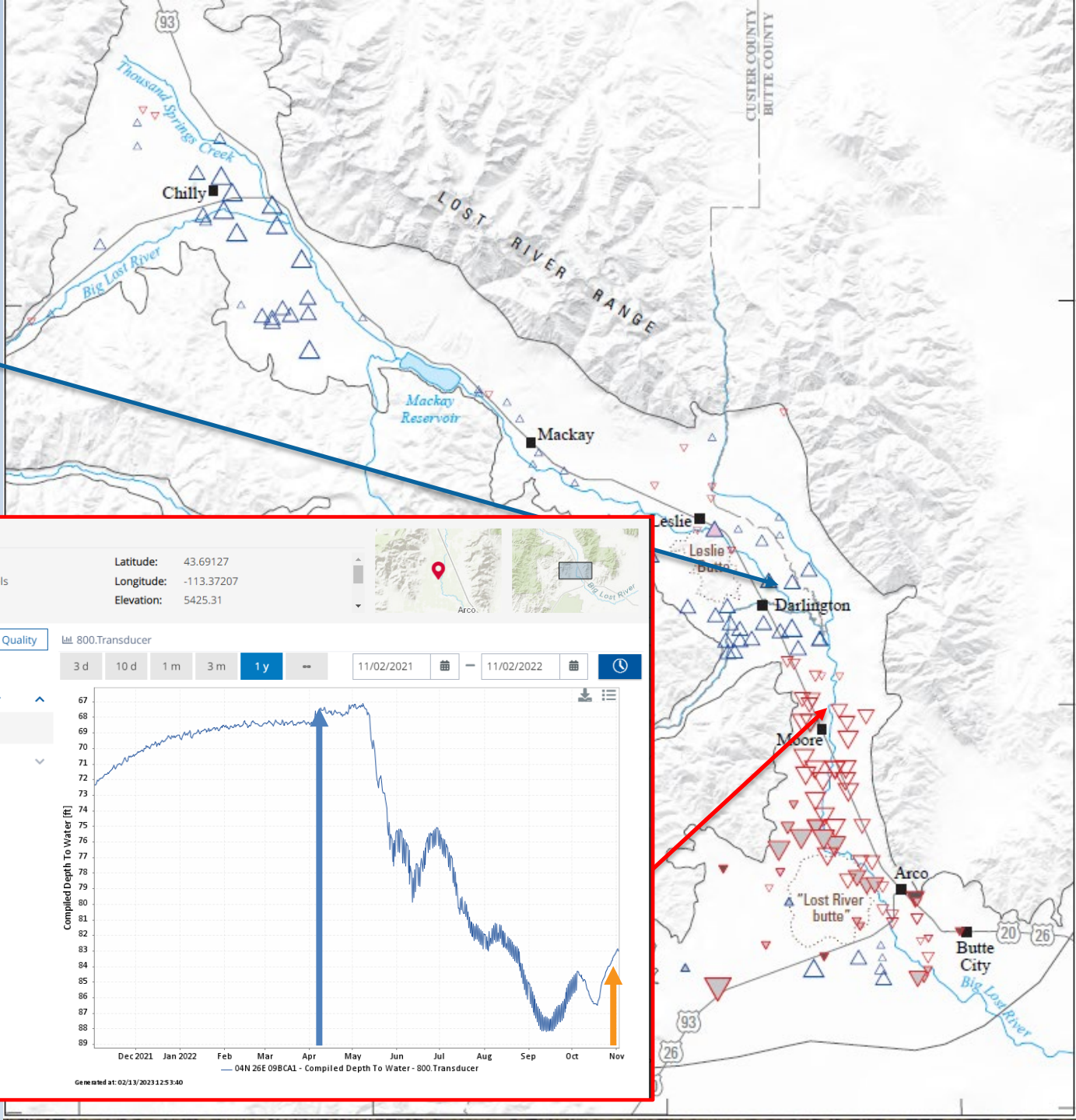
# 2022 Spring to Autumn Water-Level Change

- Rise in water levels near Chilly and Darlington
- Little change in water levels near Mackay
- Declining water levels in southern third of the valley in shallow and intermediate water-bearing units



# 2022 Spring to Autumn Water-Level Change

Increases in some areas, decreases in others



05N 26E 05DCB1

Site Name: BUTTE  
Station Type: Water Levels  
Depth: 260 (ft BGS)  
Latitude: 43.78685  
Longitude: -113.38585  
Elevation: 5597.38



Time Series Water Quality 800.Transducer

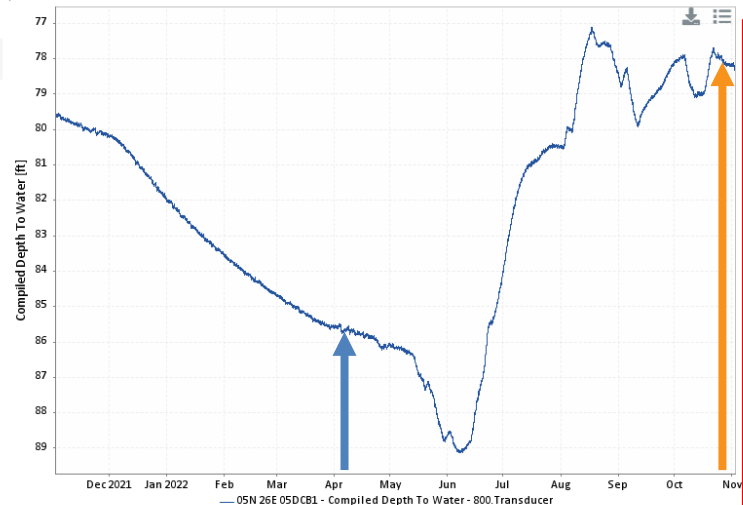
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Compiled Depth To Water

800.Transducer

Discrete Depth to Water

Documents



Generated at: 02/13/2023 12:50:38

04N 26E 09BCA1

Site Name: BUTTE  
Station Type: Water Levels  
Depth: 96 (ft BGS)  
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Longitude: -113.37207  
Elevation: 5425.31



Time Series Water Quality 800.Transducer

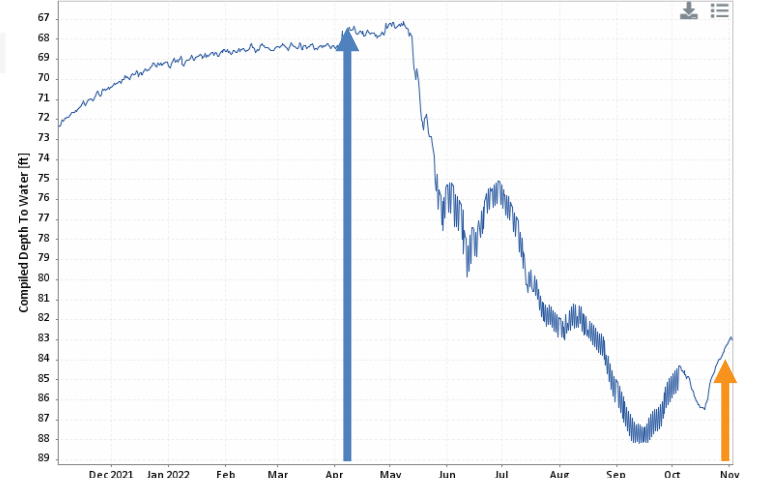
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Compiled Depth To Water

800.Transducer

Discrete Depth to Water

Documents



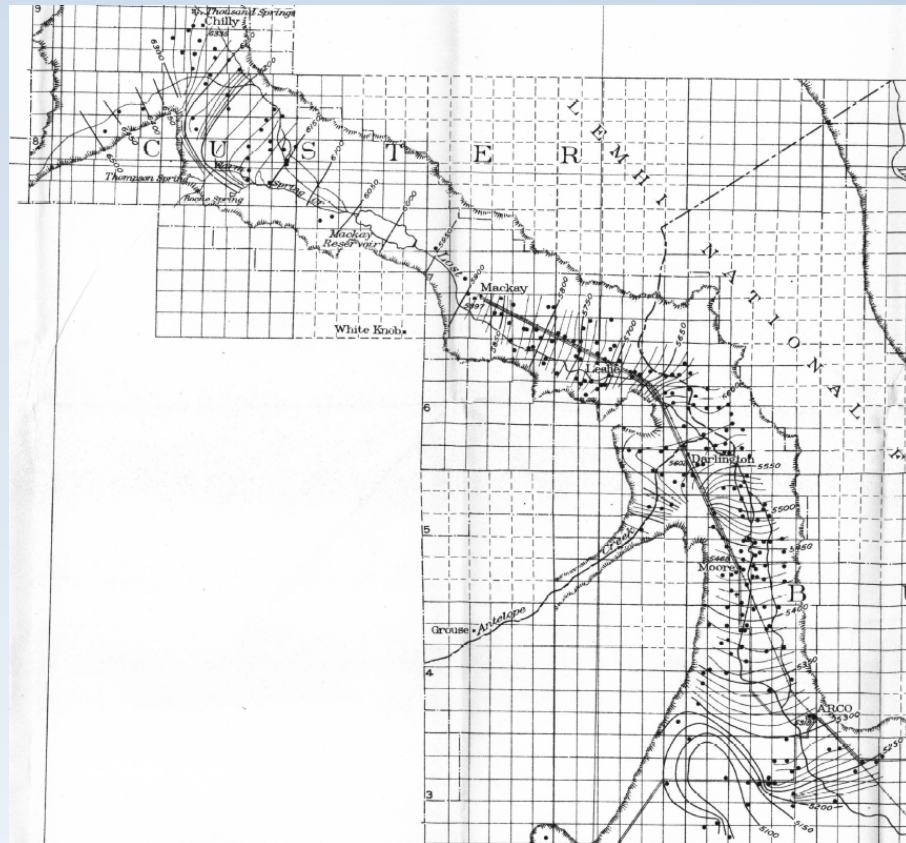
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Data from IDWR, Groundwater Data Portal

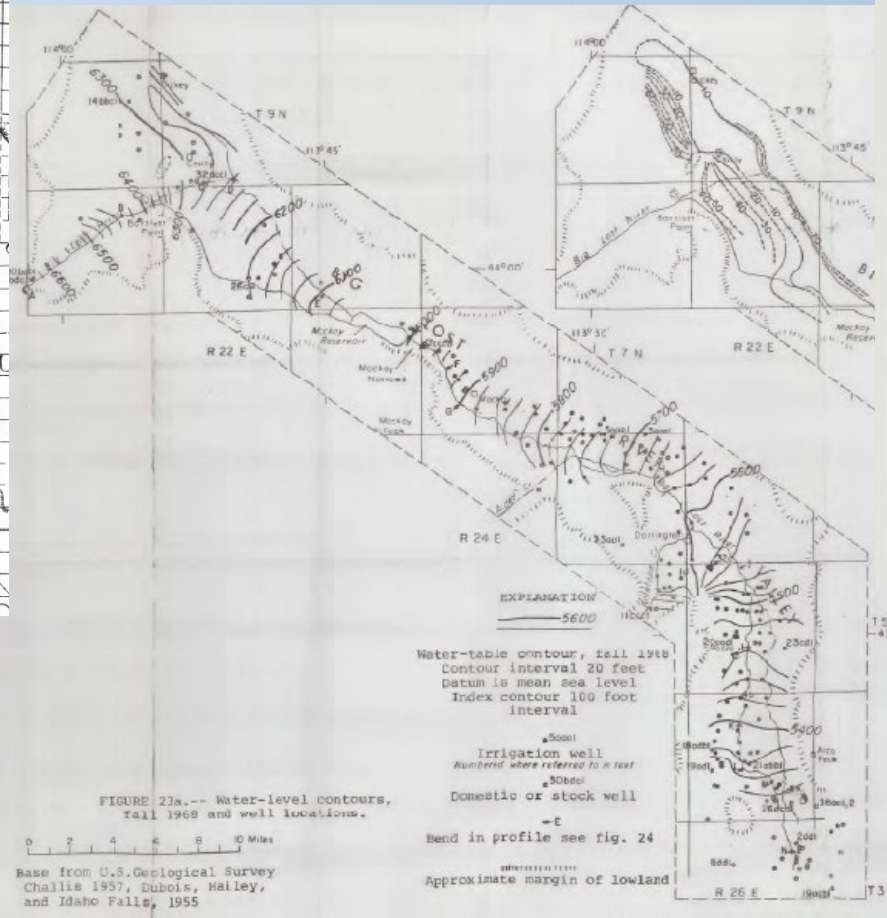


# Previous Groundwater-Level Synoptics

Stearns and others, 1938



Crosthwaite and others, 1970a

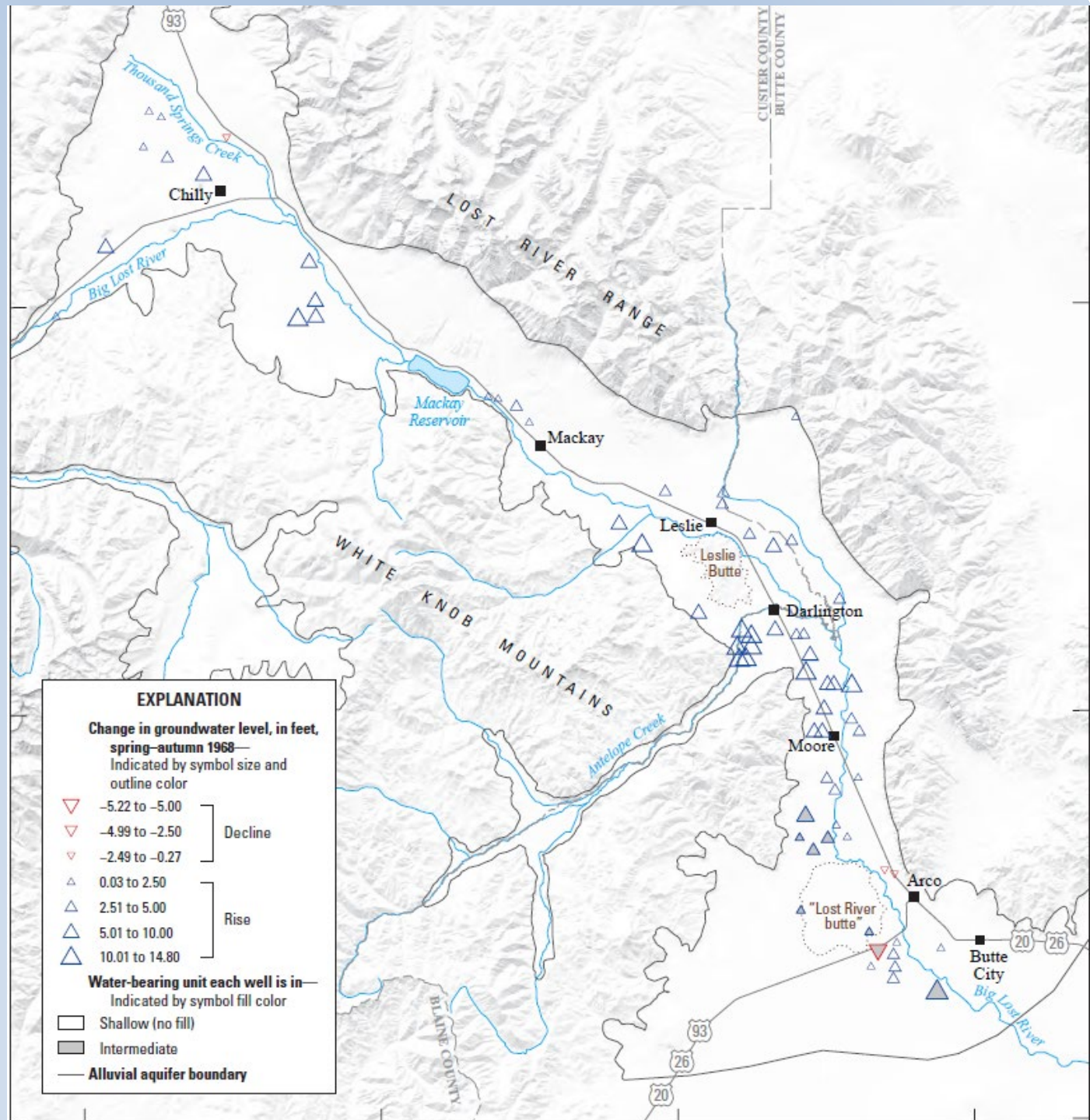


Bassick and Jones, 1992

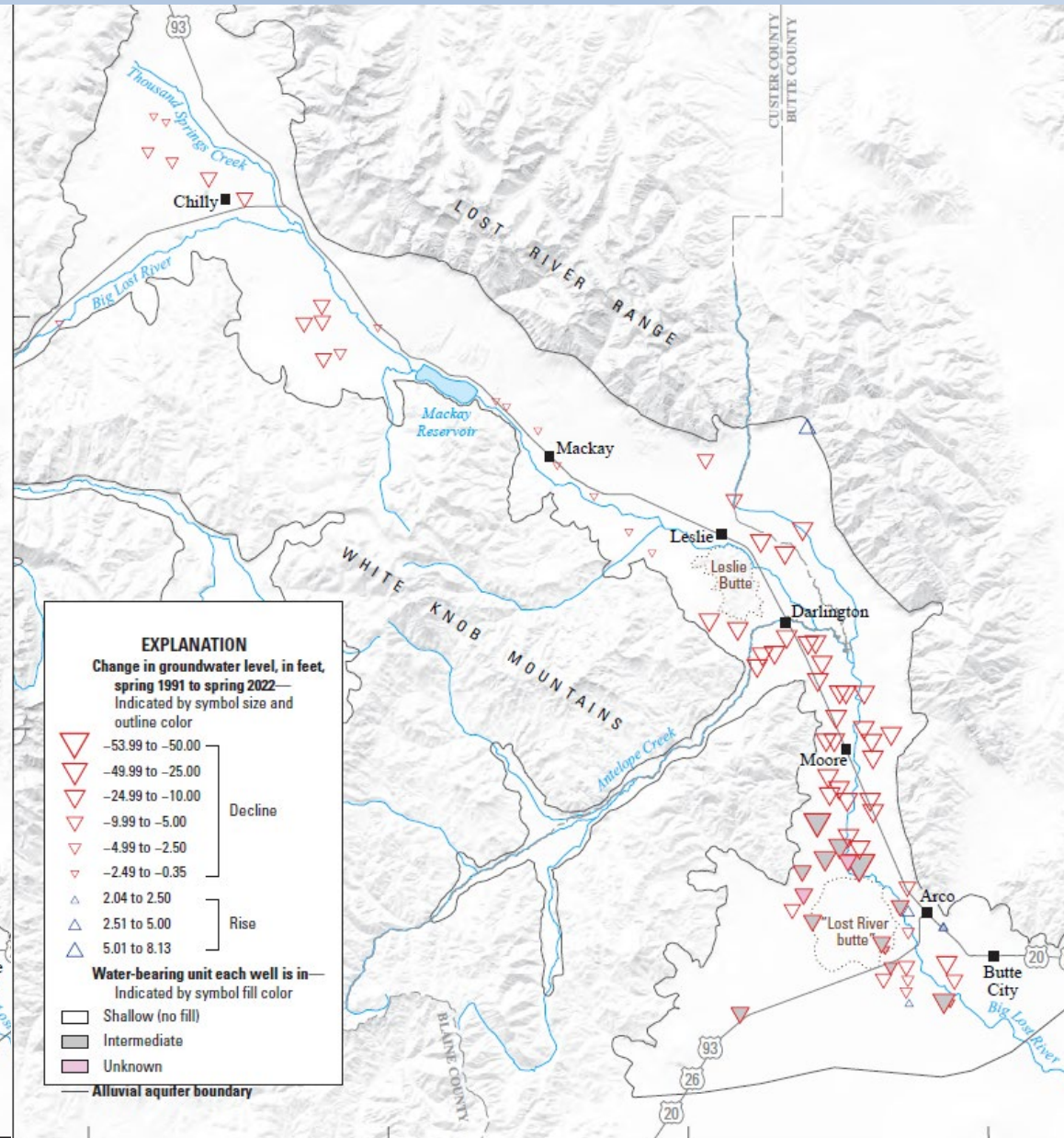
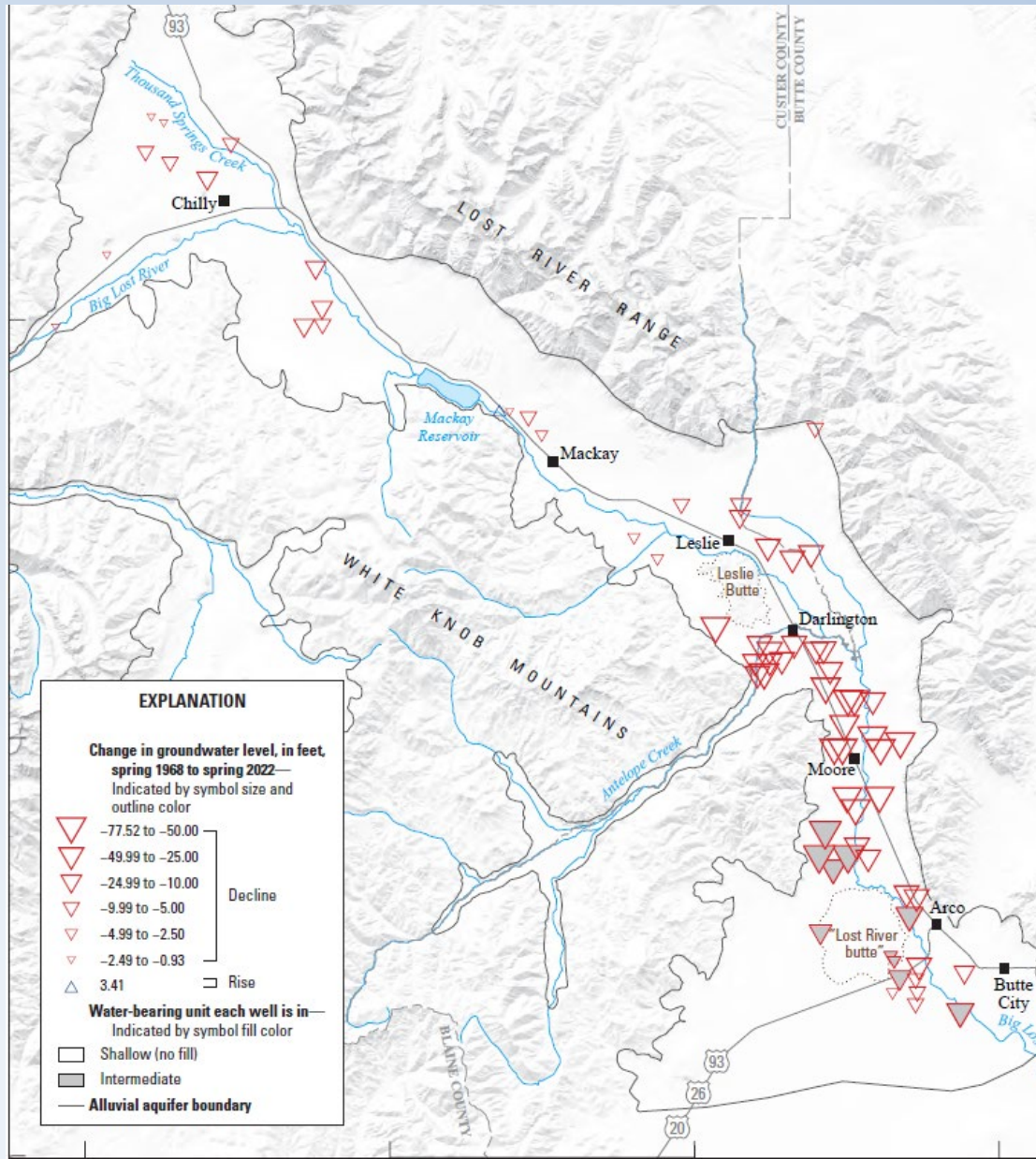


# 1968 Spring to Autumn Water-Level Change

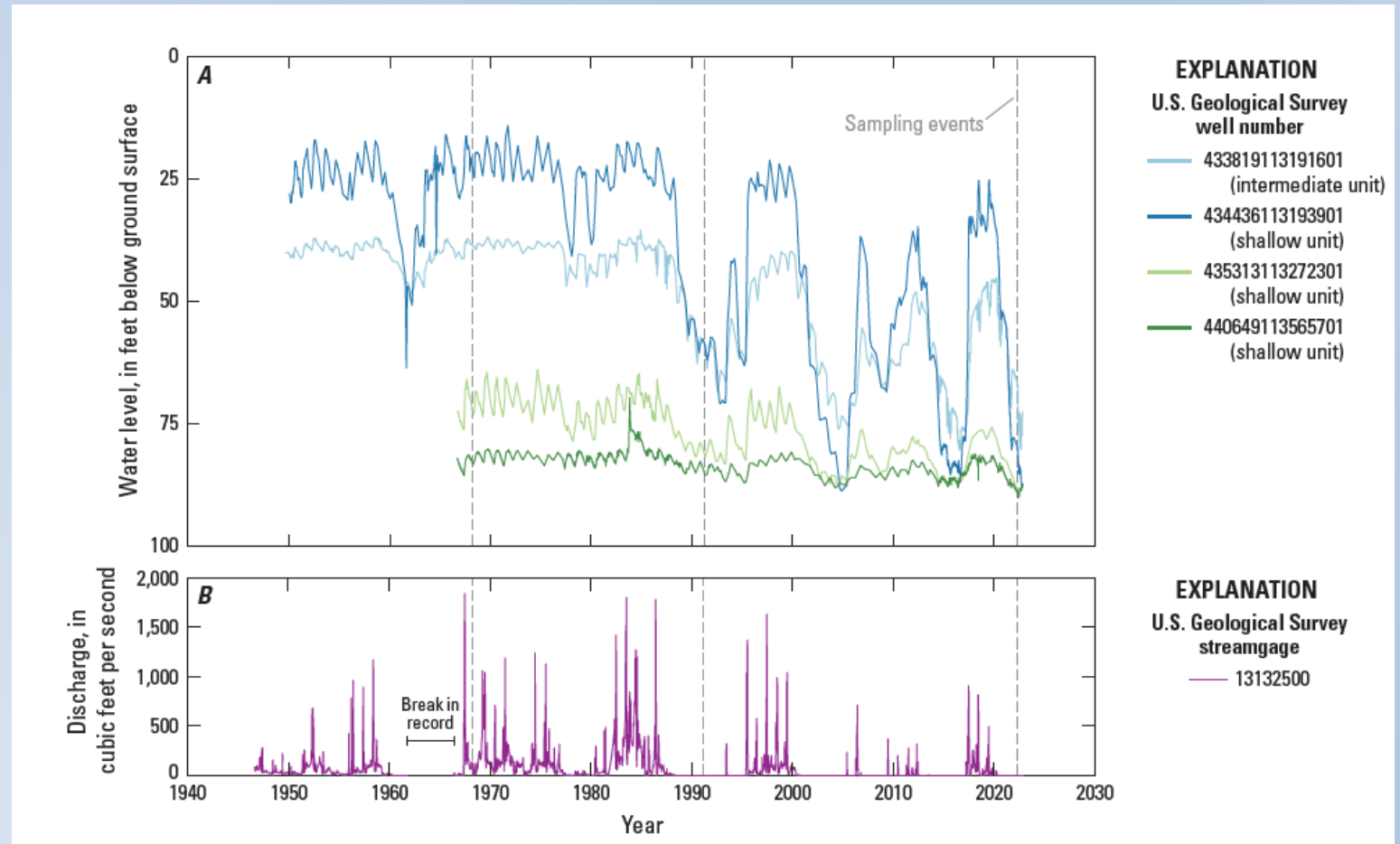
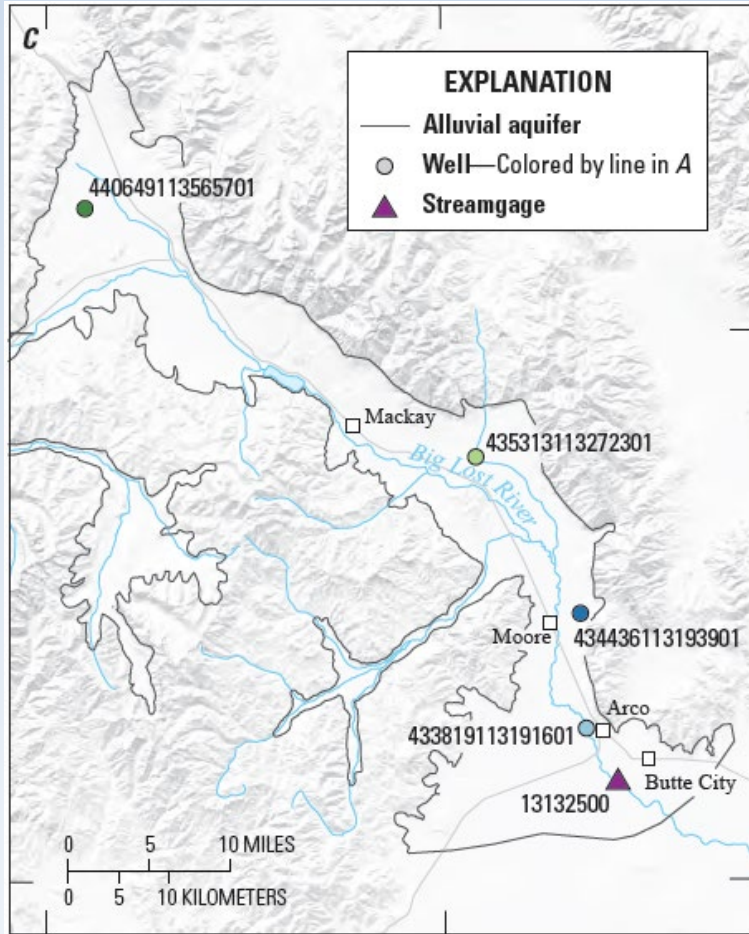
- Increased water levels in most wells in the valley, in shallow and intermediate water-bearing units
- The rise in water levels suggest recharge was generally sufficient to recover groundwater-level declines from pumping in 1968.



# 1968 to 2022 and 1991 to 2022 Water-Level Change

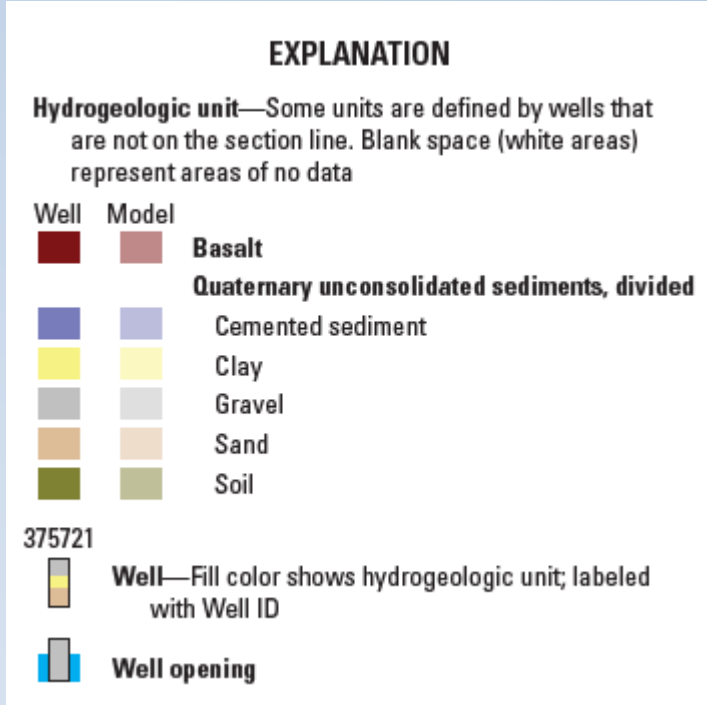
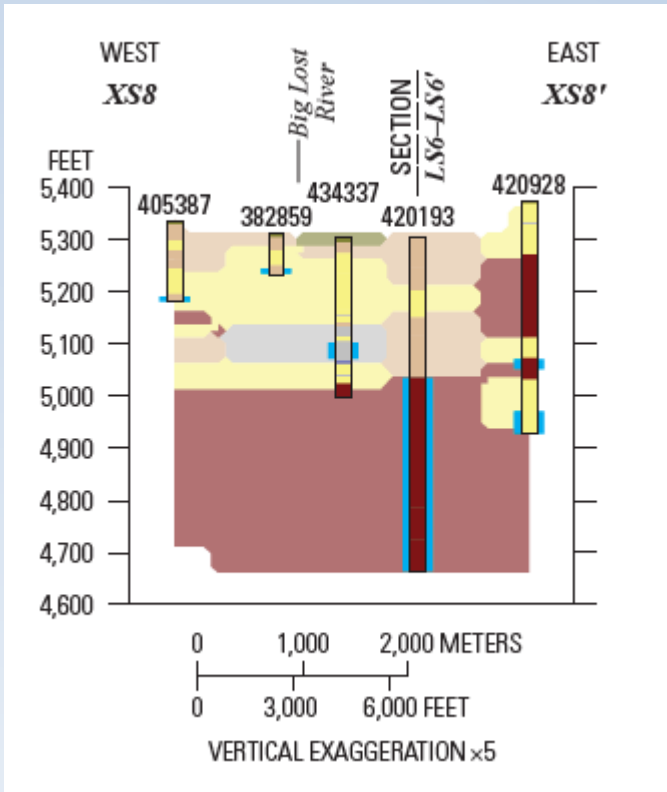


# In the context of long-term groundwater-levels





# Stephen's turn...



# Motivation

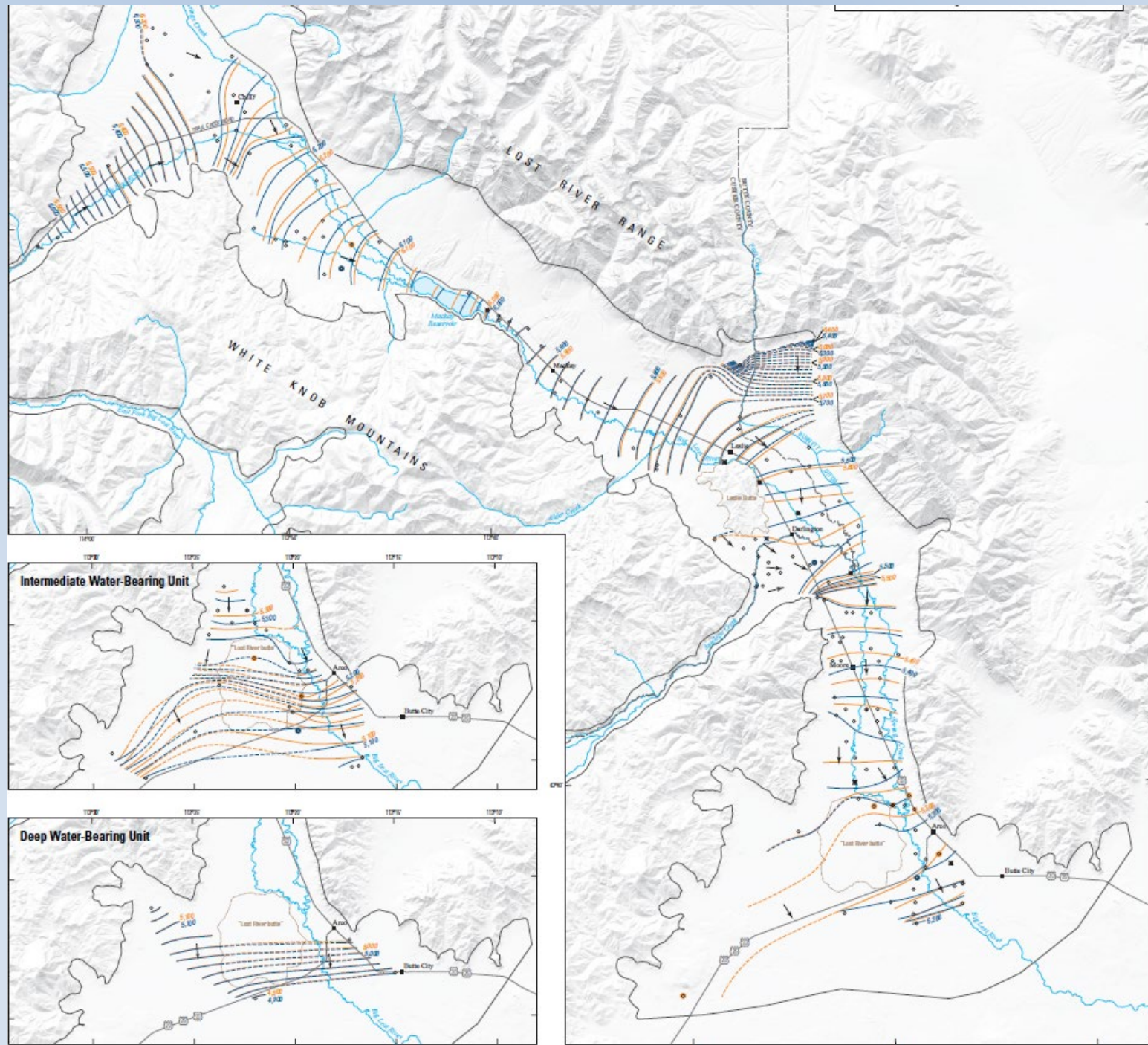
- Recognized data gap
- Last detailed potentiometric surfaces developed for 1968 (whole valley) and 1991 (southern half)
- Complexity in water-bearing units in southern end of the basin

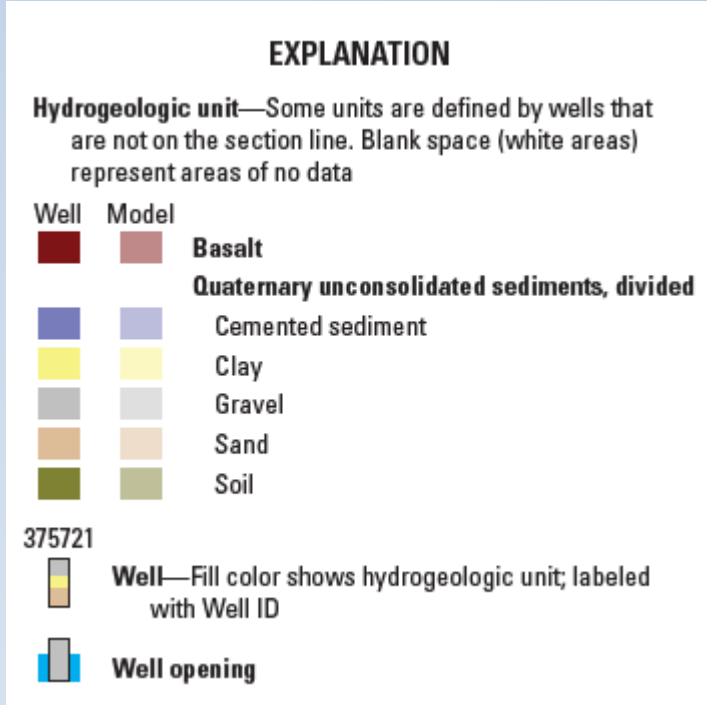
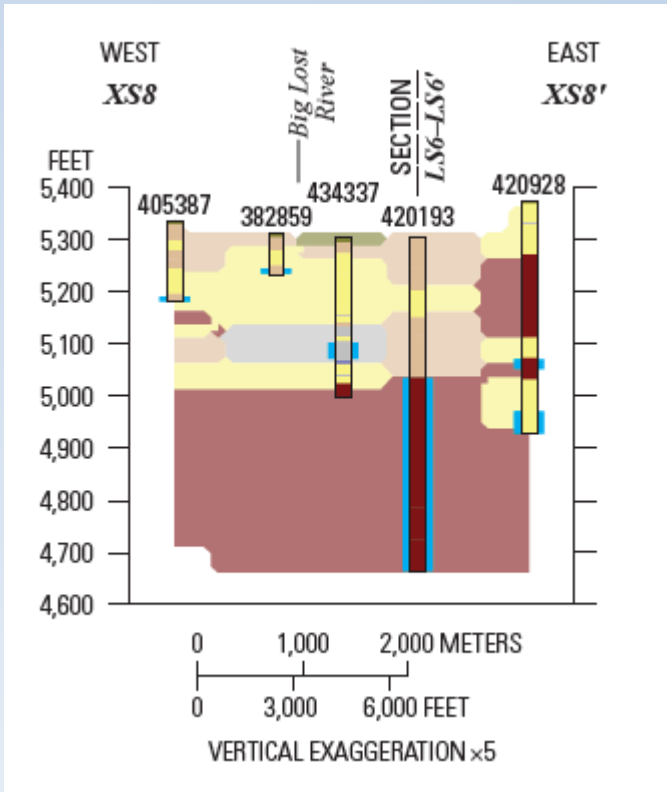
# Goals

- **Improve hydrogeologic understanding**
- Support groundwater modeling
- Inform water rights administration



# Improve Hydrogeologic Understanding





# Motivation

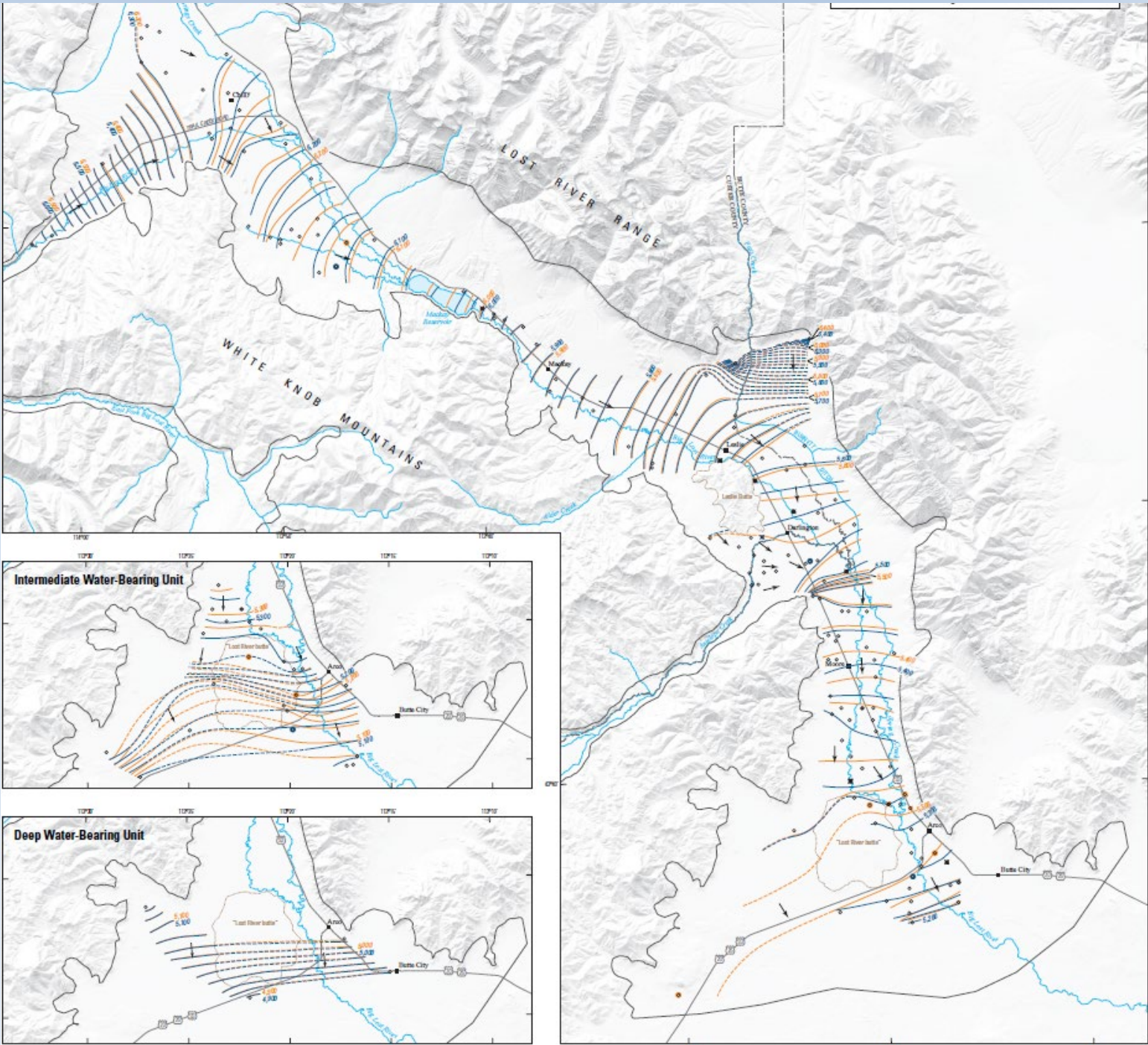
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# Goals

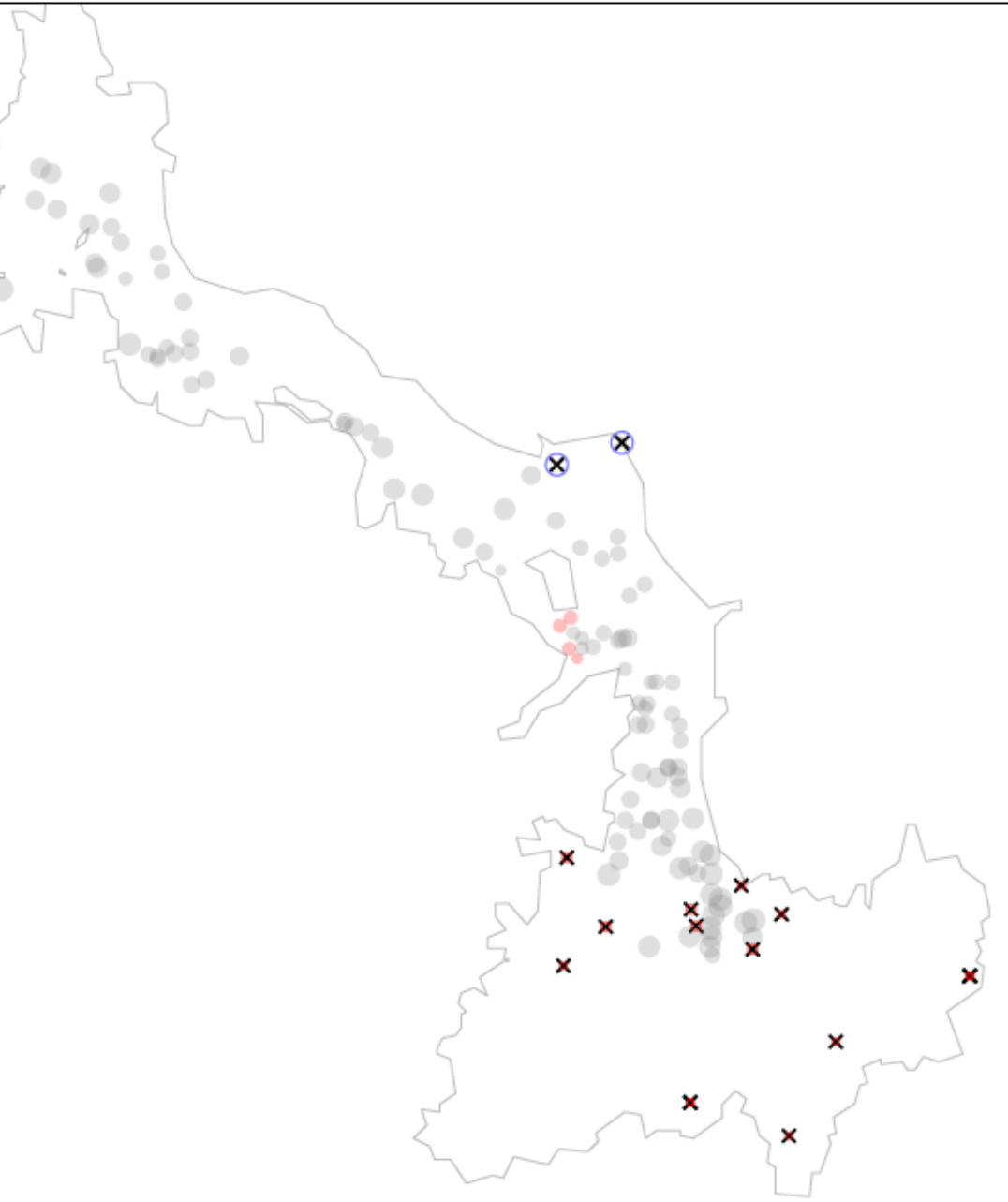
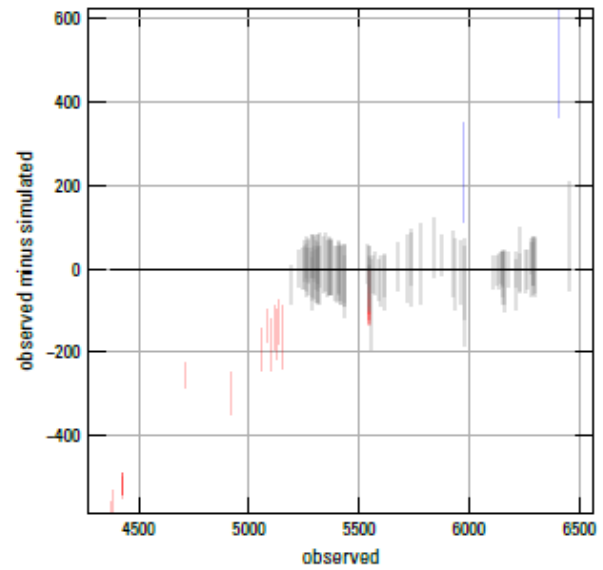
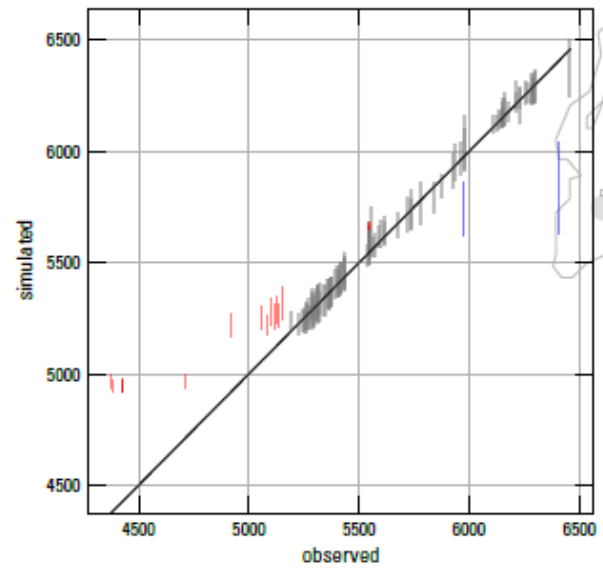
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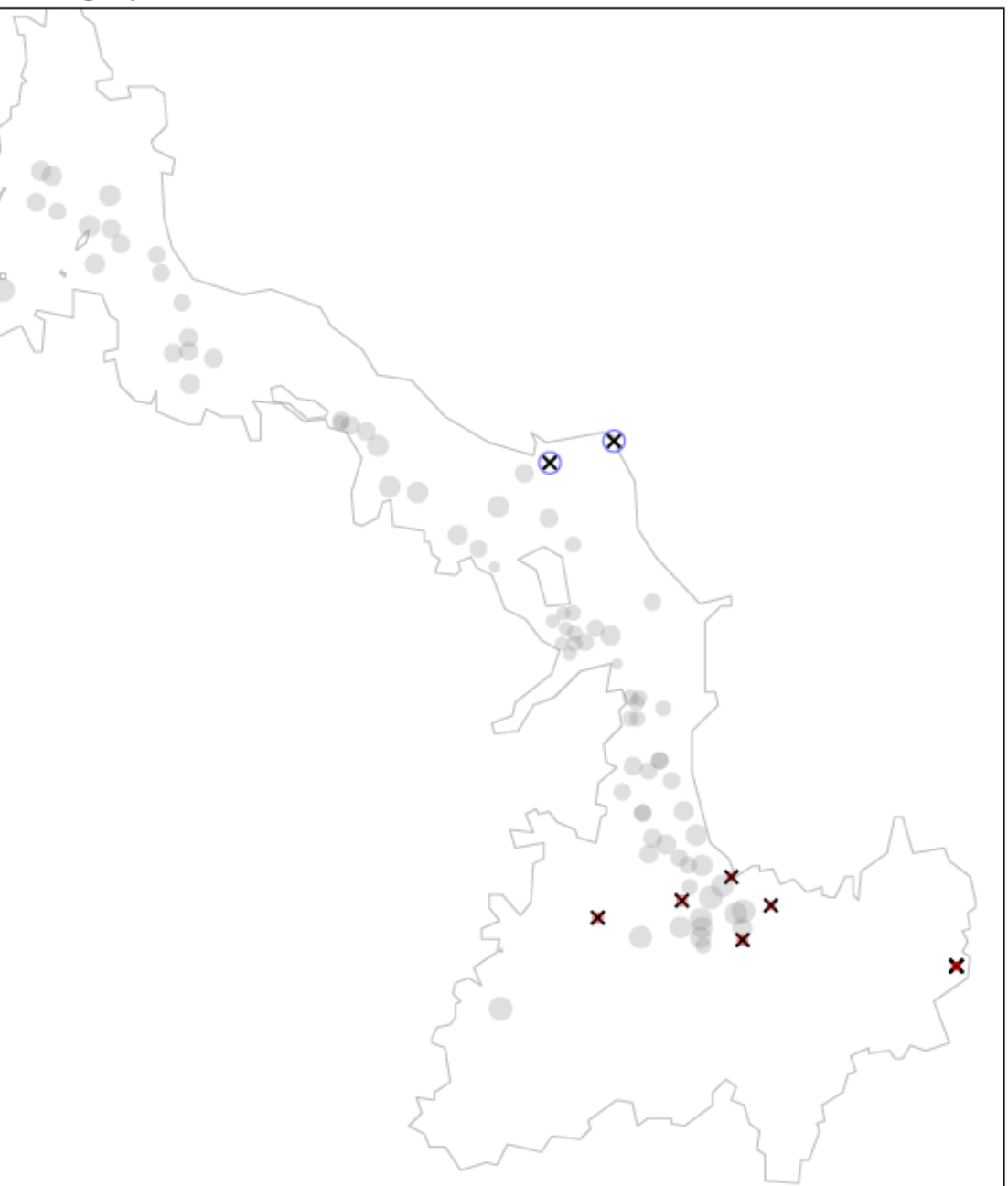
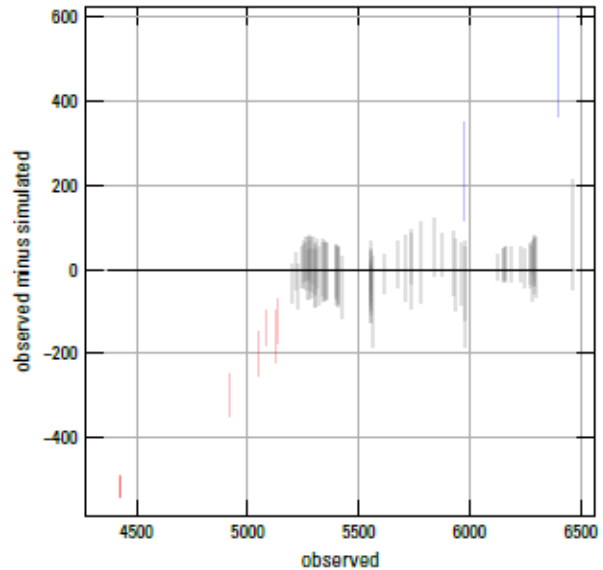
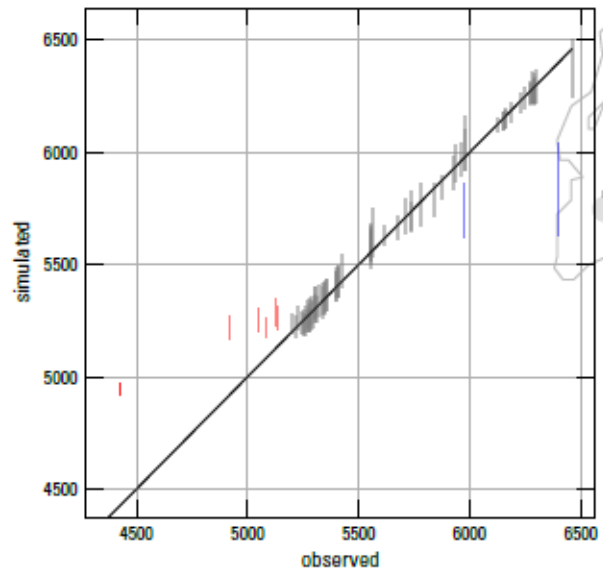
# Support Groundwater Modelling



# Support Groundwater Modelling

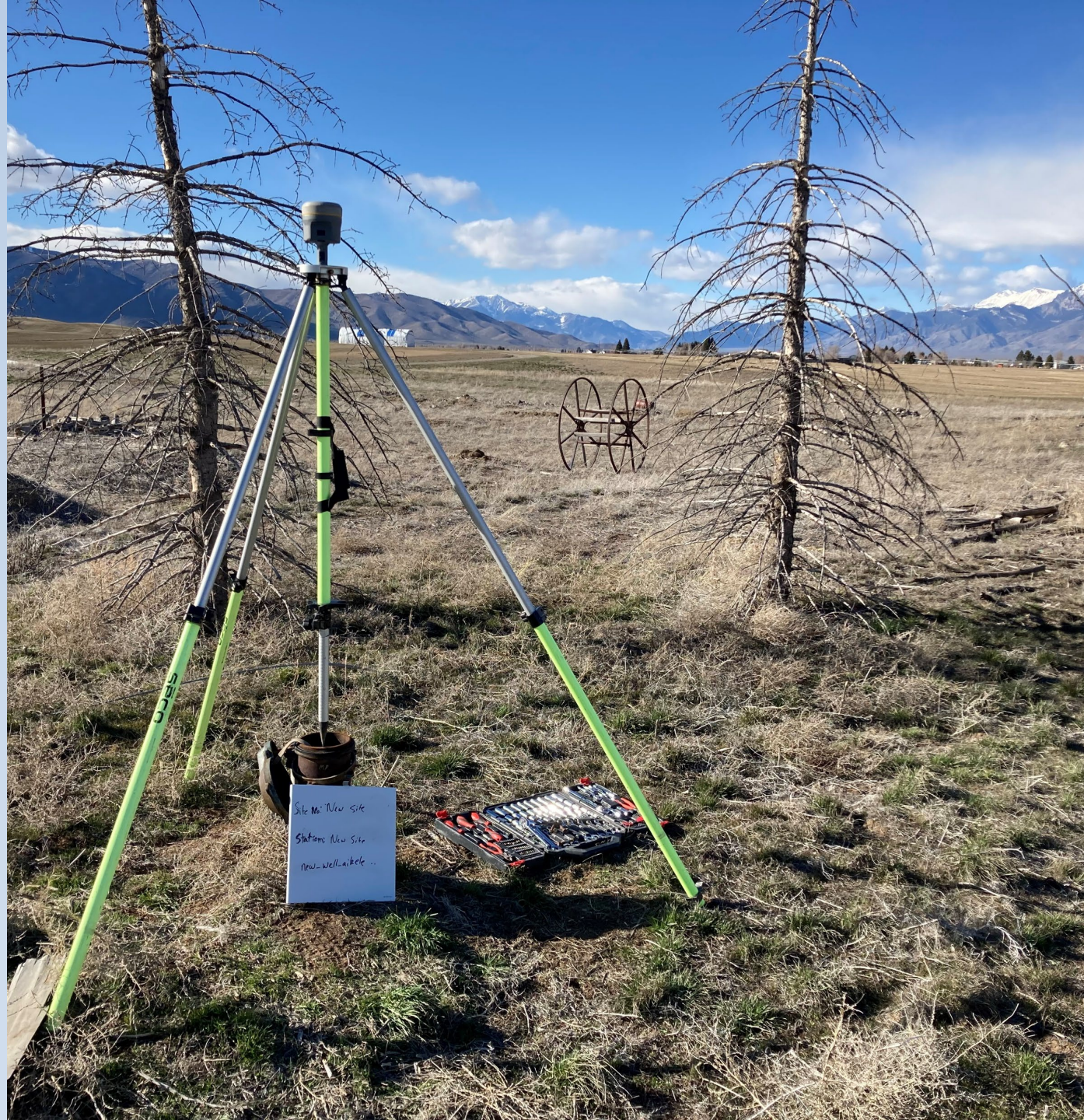


# Support Groundwater Modelling



# Summary

- Groundwater levels declined in most wells in southern end of valley between spring 2022 and autumn 2022
- Suggests recharge and down-valley groundwater flows were insufficient to fully recover groundwater levels across the 2022 irrigation season
- Long-term groundwater hydrographs are sensitive to interannual wet and dry periods but indicate declining groundwater levels overall





# Questions?

**Check out the details!**

Ducar and Zinsser, 2023

- Map and pamphlet:

<https://doi.org/10.3133/sim3509>

- Data release:

<https://doi.org/10.5066/P93NQAP9>



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