Treasure Valley Groundwater-Level Change Maps:

1980-2000, 2000-2025, and 2021-2025

IDAHO DEPARTMENT OF WATER RESOURCES

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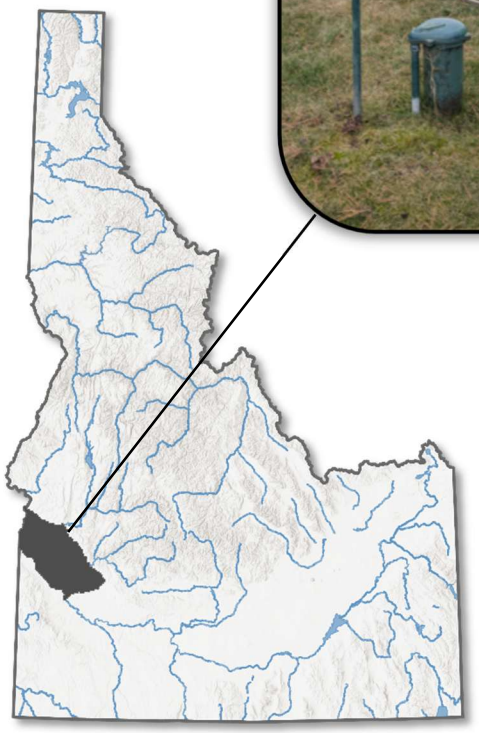

Open-File Report

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The Idaho Department of Water Resources (IDWR) conducts investigations, surveys, and studies relative to the extent, nature, and location of the groundwater resources of the state (Idaho Code, §42-231).

Introduction

IDWR developed groundwater-level change maps to illustrate changes in groundwater levels across the Treasure Valley. Maps at the end of this report show groundwater-level change in the Treasure Valley for three comparison periods: 1980 to 2000, 2000 to 2025, and 2021 to 2025. The maps are intended to identify broad spatial patterns rather than characterize individual wells.

Data and Methods

Data were obtained from the IDWR groundwater-level database which is publicly available at the Groundwater Data Portal[1]. Discrete data (e.g., collected via hand measurements) were exclusively used for the analysis. Groundwater-level change was calculated for each well as the difference between groundwater levels measured during a later time and those measured during an earlier time.

The study area was defined by the Treasure Valley Groundwater Flow Model[2] boundary and contains two designated Groundwater Management Areas (GWMAs): the Southeast Boise GWMA (designated in 1994) and the Boise Front Low-Temperature Geothermal Resource GWMA (designated in 1987).

The time periods were selected based on data availability. Data availability depends on the number of wells measured annually during spring months and whether those wells were measured consistently over time. For example, if the comparison period was 1980 to 2000, and a well was measured in 1980 but not in 2000, the well was not included in the analysis.

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[1] The IDWR Groundwater Data Portal includes an interactive map of groundwater-level data for select sites as well as a bulk download (https://idwr-groundwater-data.idaho.gov/).

[2] Hundt, Stephen, and Bartolino, James R. 2023. Groundwater-Flow Model of the Treasure Valley, Southwestern Idaho, 1986–2015. U.S. Geological Survey, 2023. Groundwater-flow model of the Treasure Valley, southwestern Idaho, 1986–2015 | U.S. Geological Survey

Measurements were limited to spring months (March, April, and May) because these months best represent non-pumping, pre-irrigation season aquifer conditions.

IDWR currently maintains an active measurement network in the Treasure Valley of approximately 200 wells. Some years have more groundwater-level measurements than others because of other studies in the area (Figure 1). For example, additional measurements were collected in 1970 and 1980 as part of U.S. Geological Survey studies and in 1996, 1998, and 2000 as part of the Treasure Valley Hydrologic Project[3]. Based on data availability, the years 1980, 2000, 2021, and 2025 were selected for analysis (Figure 1).

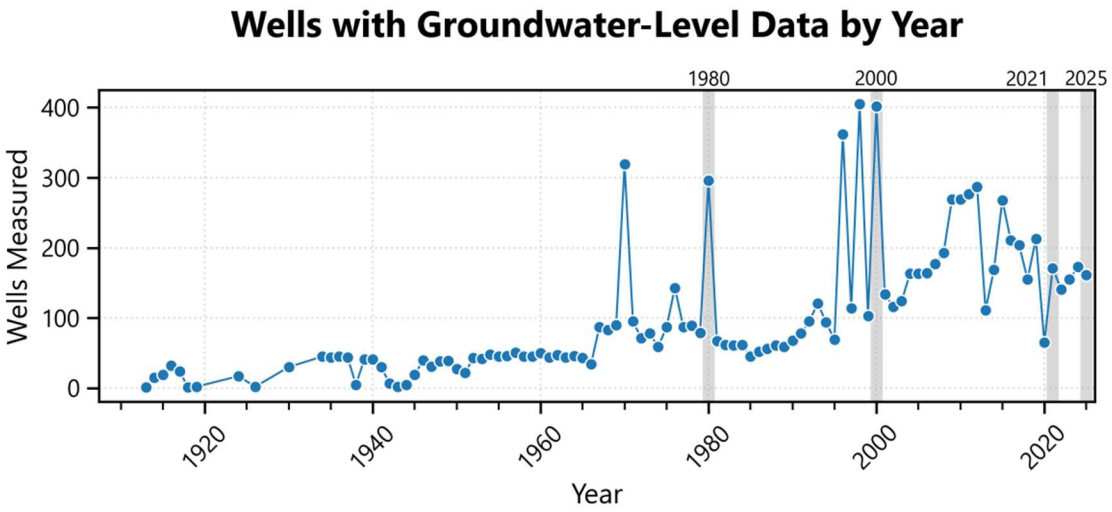

Figure 1. Number of wells measured annually in the Treasure Valley. The years 1980, 2000, 2021, and 2025 were selected for analysis due to the relatively large amount of data available and/or recency of data.

To increase the number of data points available for analysis, groundwater-level data were selected from a range of years for specific comparison periods. For example, for the reference year of 1980, spring groundwater-level data from 1978 through 1982 were used to calculate a median groundwater level for each well. When multiple measurements were available for a well during a single year, the shallowest measurement was selected to reduce potential impacts from pumping. Details about the year ranges used are summarized in Table 1 and are listed on each map. This approach increased the number of data points available for the 1980 to 2000 and 2000 to 2025 maps by 29% and 38%, respectively.

[3] Petrich, Christian R. 2004. Treasure Valley Hydrologic Project Executive Summary. Idaho Water Resources Research Institute. https://idwr.idaho.gov/wp-content/uploads/sites/2/projects/treasure-valley/TVHP-Exec-Summary.pdf

Table 1. Summary of comparison periods for each map, the years used for data selection, and the number of wells analyzed for each period.

Comparison Period	Earlier Year Range	Later Year Range	Number of Wells
1980 to 2000	1978, 1979, 1980, 1981, 1982	1998, 1999, 2000, 2001, 2002	103
2000 to 2025	1998, 1999, 2000, 2001, 2002	2023, 2024, 2025	114
2021 to 2025	2021	2025	135

Measurements determined to be affected by pumping and measurements reported by drillers were excluded from the analysis. Hydrographs were reviewed to provide a quality check for reported values.

As groundwater levels are influenced by climate, the Palmer Drought Severity Index (PDSI) provides a measure of long-term moisture conditions by incorporating precipitation, temperature, evapotranspiration, and soil moisture[4]. Positive values indicate wet periods and negative values indicate drought, with larger values indicating the severity of wet or dry periods. The PDSI analysis indicates the analysis years span several different conditions from moderate wet spell to severe drought (Table 2, Figure 2).

Table 2. Precipitation and PDSI values for each analysis year and corresponding year ranges. PDSI values are accompanied by their description. Data were obtained from NOAA's database for Southwestern Valleys in Idaho[5].

	Precipitation (inches)		PDSI	
	Explicit Year	***Year Range Mean***	***Explicit Year***	***Year Range Mean***
1980	15.21	15.82 (1978 to 1982)	1.71 *Mild wet spell*	2.25 (1978 to 1982) *Moderate wet spell*
2000	11.60	12.78 (1998 to 2002)	-2.65 *Moderate drought*	-1.35 (1998 to 2002) *Mild drought*
2021	10.89	-	-3.33 *Severe drought*	-
2025	14.25	14.16 (2023 to 2025)	-1.95 *Mild drought*	-0.36 (2023 to 2025) *Near normal*
Overall Mean (1980-2025)	13.85		-0.77	

[4] Rhee, J., and Carbone, G.J., 2007, A comparison of weekly monitoring methods of the Palmer drought index: Journal of Climate, v. 20, p. 6033–6044, https://doi.org/10.1175/2007JCLI1693.1.

[5] NOAA National Centers for Environmental Information (NCEI), "Climate at a Glance: Divisional Time Series, Idaho Southwestern Valleys Palmer Drought Severity Index (PDSI), 1-Month Time Scale for August" accessed June 1, 2026, https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/divisional/time-series/0309/pdsi.

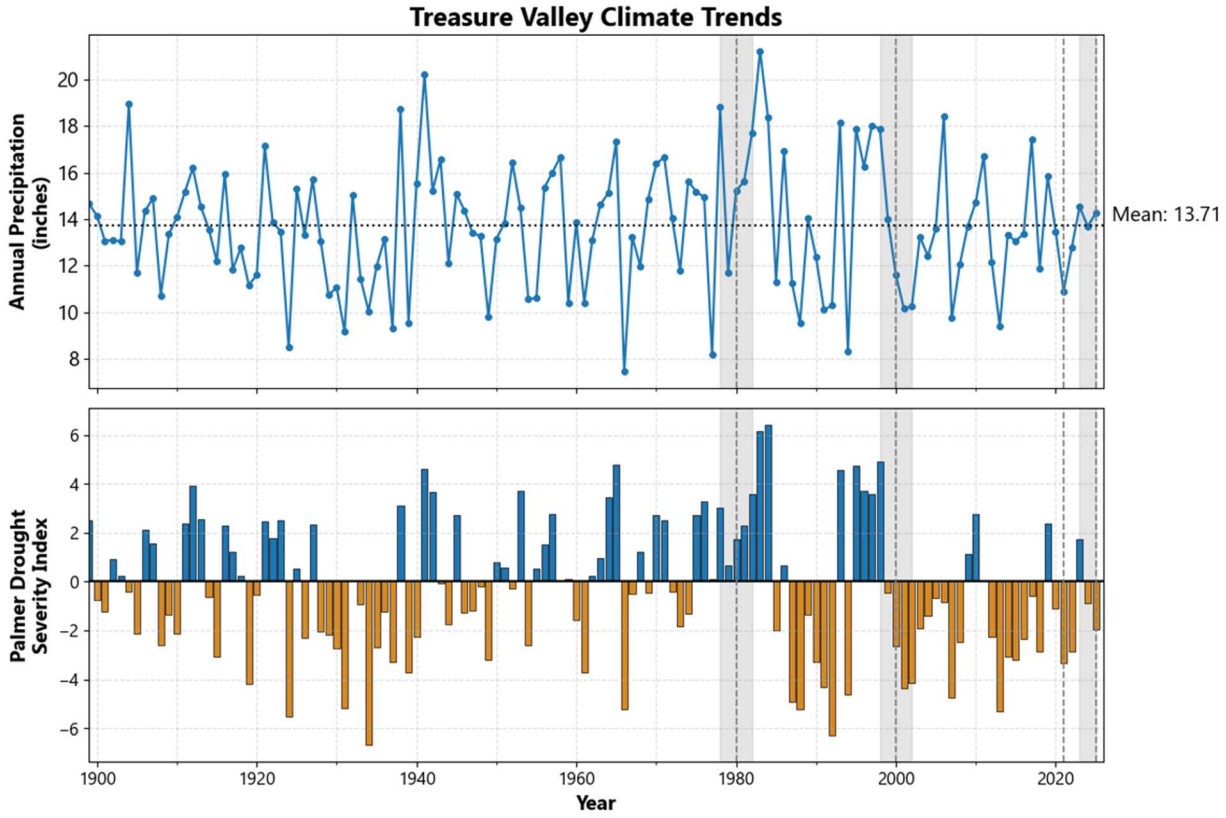

Figure 2. Precipitation and Palmer Drought Severity Index versus time. Study years are marked with a dotted vertical line surrounded by a gray bar to represent year ranges where applicable. Data obtained from NOAA's database for Southwestern Valleys in Idaho.

Well depths were identified from completion depths reported on drilling logs. Well completion depth does not necessarily equate to the depth from which a well obtains water, as this depends on the interval that is open to the aquifer. Well depths were placed into three categories consistent with the Treasure Valley Hydrologic Project[6]: shallow (less than 200 ft), intermediate (200 to 400 ft), and deep (greater than 400 ft).

Results

Groundwater-level changes for three comparison periods (1980 to 2000, 2000 to 2025, and 2021 to 2025) are shown on subsequent maps at the end of this report. The distribution of groundwater-level change values is summarized with histograms in Figure 3.

Between 1980 and 2000, groundwater-level declines were more common than rises across all three well-depth categories (Figure 3). Both shallow and deep wells were more likely to

[6] Petrich, Christian R. and Urban, Scott M. 2004. Characterization of the Treasure Valley Hydrologic System. Idaho Water Resources Research Institute. https://idwr.idaho.gov/wp-content/uploads/sites/2/projects/treasure-valley/TVHP-Characterization.pdf.

experience declining water levels. Deep wells, especially those located near the Southeast Boise GWMA, exhibited the largest declines, with several decreasing by over 50 ft. Groundwater-level increases did occur at all well depths but were less common, and approximately one-third of all wells showed little to no change (±1 ft). Climatic conditions may have contributed to some of the observed groundwater-level declines during this period. The earlier comparison period (1978–1982) coincided with a moderate wet spell, whereas the later period (1998–2002) coincided with mild drought conditions.

From 2000 to 2025, declines became more frequent in shallow and intermediate-depth wells. Deep wells, however, showed a shift towards rising groundwater levels, including those located in the Southeast Boise GWMA where several deep wells exhibited rising water levels of over 50 ft. These rises are likely attributed to a combination of efforts implemented in the GWMA by water users, including a reduction in pumping and managed aquifer recharge. About one-quarter of all wells showed little to no change.

In the most recent comparison period, 2021 to 2025, the valley displayed a more even distribution of rising and declining groundwater levels across all well depths. About one-third of all wells showed little to no change.

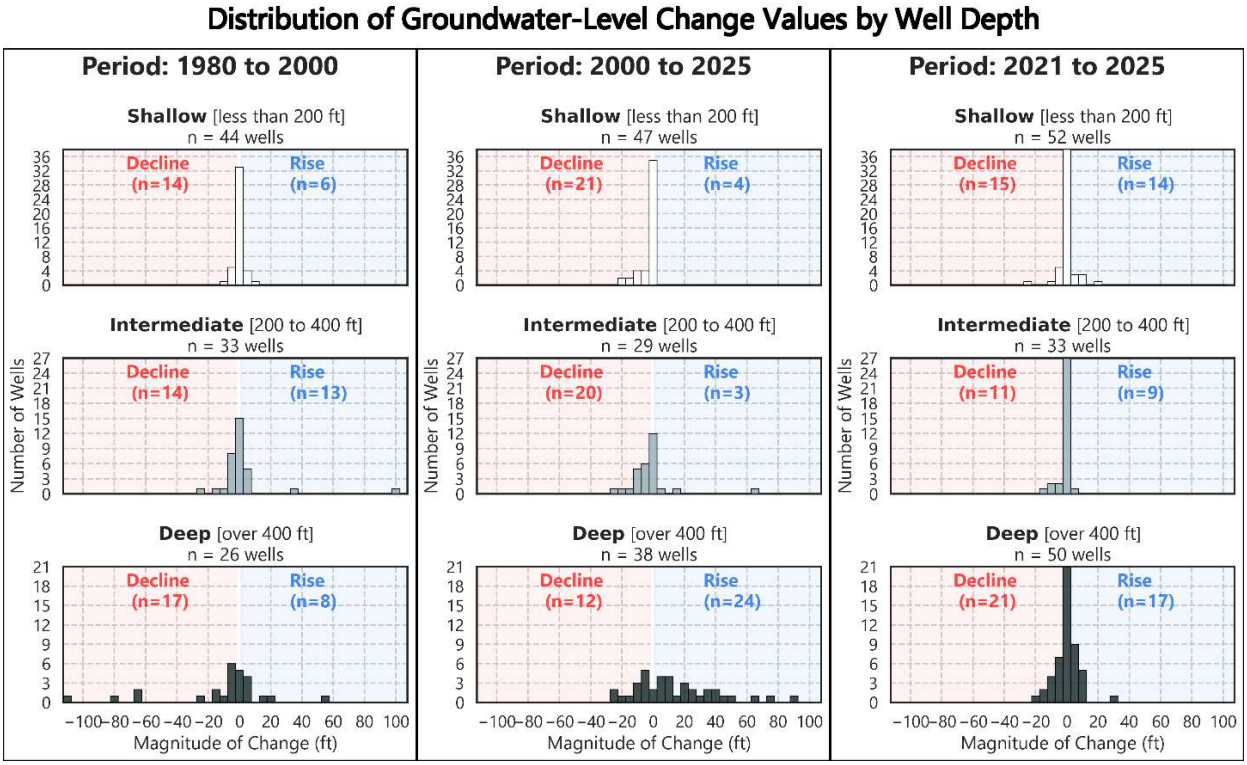

Figure 3. Distribution of groundwater-level change values by year range and well completion depth. Wells were categorized with a rising or declining condition if the change had a magnitude greater than one foot of change. Bars are shaded according to well completion depth.

Limitations

Several potential factors that impact groundwater levels include climate, irrigation practices, land use trends, recharge conditions, and both localized and regional pumping. The interaction among these factors makes it difficult to determine which is primarily responsible for observed changes.

Groundwater levels can also be impacted by changes to a well such as deepening, rehabilitation, or other modifications. Manual data collection in wells makes it difficult to conclude trends due to the uncertainty regarding the seasonal peaks and troughs of the hydrographs. All analyses should recognize the limitations of the data as well as the associated uncertainties.

The spatial coverage of wells changes for each period which can make direct comparisons difficult. Data availability for wells depends on many factors including access from property owners, date of construction or destruction, and inclusion in a measurement program.

Relatively small groundwater-level changes such as ±1 ft are displayed on the maps as increases and decreases, respectively. Care should be taken when interpreting maps that include very small groundwater-level changes.

Summary

The following groundwater-level change maps indicate that groundwater conditions in the Treasure Valley have varied substantially over time and differ by location and well depth. Long-term changes reflect the combined influence of climatic variability, groundwater development, irrigation practices, recharge conditions, and other hydrologic factors. Because multiple factors affect groundwater levels, the maps are intended to illustrate regional patterns of groundwater-level change rather than to characterize the cause of changes at individual wells.

IDWR currently maintains a monitoring network of about 200 wells in the Treasure Valley that are measured twice each year, in spring and fall, and approximately 50% are equipped with continuous data loggers. IDWR continues to expand the network by adding wells in areas where information is limited, in places experiencing rapid development, and in locations where water-level changes are a concern. IDWR also partners with other organizations, such as the U.S. Geological Survey and consulting groups, to add more groundwater-level measurements to the statewide database.

Treasure Valley Groundwater-Level Changes: 1980 to 2000

Magnitude of change (feet)

Decrease

- -107.6 to -100.1
- -100.0 to -90.1
- -90.0 to -80.1
- -80.0 to -70.1
- -70.0 to -60.1
- -60.0 to -50.1
- -50.0 to -40.1
- -40.0 to -30.1
- -30.0 to -20.1
- -20.0 to -10.1
- -10.0 to -5.1
- -5.0 to -0.1

Increase

- 0.0 to 5.0
- 5.1 to 10.0
- 10.1 to 20.0
- 20.1 to 30.0
- 30.1 to 40.0
- 40.1 to 50.0
- 50.1 to 60.0
- 60.1 to 70.0
- 70.1 to 80.0
- 80.1 to 89.5

Well completion depth for each well indicated by symbol fill color

- Shallow [less than 200 feet]
- Intermediate [200 to 400 feet]
- Deep [over 400 feet]

Groundwater Management Areas (GWMA)

- Southeast Boise GWMA
- Boise Front Low-Temperature Geothermal Resource GWMA
- Geothermal wells inside the Boise Front GWMA surrounded with orange glow

Study Area

- Treasure Valley Groundwater Model Boundary (2023)

Groundwater level is the depth measured from the ground surface to the groundwater surface in a well. Changes in groundwater level are shown for **103 wells** to compare conditions from 1980 to 2000.

Measurements were from spring months (March to May) to minimize seasonal variations. Each time period represents the median value from a range of years to improve data availability. 1980 reflects data from 1978 to 1982. 2000 reflects data from 1998 to 2002. Measurements visibly affected by pumping conditions were excluded from analysis.

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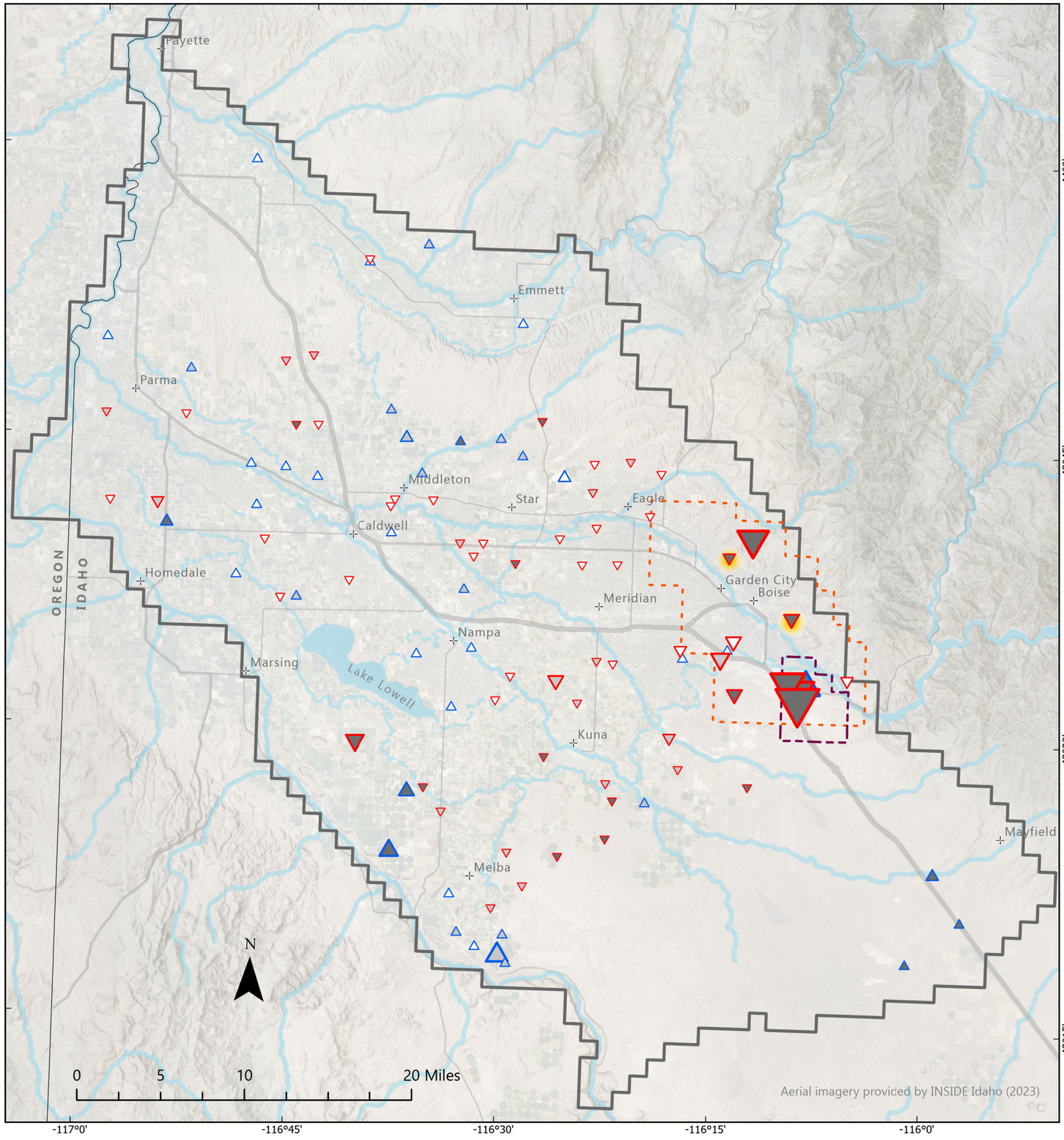
MAP CREATED FEBRUARY 2026



Treasure Valley Groundwater-Level Changes: 2000 to 2025

Magnitude of change (feet)

Decrease

- -107.6 to -100.1
- -100.0 to -90.1
- -90.0 to -80.1
- -80.0 to -70.1
- -70.0 to -60.1
- -60.0 to -50.1
- -50.0 to -40.1
- -40.0 to -30.1
- -30.0 to -20.1
- -20.0 to -10.1
- -10.0 to -5.1
- -5.0 to -0.1

Increase

- 0.0 to 5.0
- 5.1 to 10.0
- 10.1 to 20.0
- 20.1 to 30.0
- 30.1 to 40.0
- 40.1 to 50.0
- 50.1 to 60.0
- 60.1 to 70.0
- 70.1 to 80.0
- 80.1 to 89.5

Well completion depth for each well indicated by symbol fill color

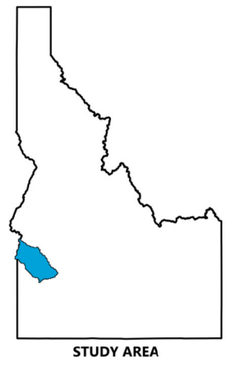
- Shallow [less than 200 feet]
- Intermediate [200 to 400 feet]
- Deep [over 400 feet]

Groundwater Management Areas (GWMA)

- Southeast Boise GWMA
- Boise Front Low-Temperature Geothermal Resource GWMA
- Geothermal wells inside the Boise Front GWMA surrounded with orange glow

Study Area

- Treasure Valley Groundwater Model Boundary (2023)



Groundwater level is the depth measured from the ground surface to the groundwater surface in a well. Changes in groundwater level are shown for **114 wells** to compare conditions from 2000 to 2025.

Measurements were from spring months (March to May) to minimize seasonal variations. Each time period represents the median value from a range of years to improve data availability. 2000 reflects data from 1998 to 2002. 2025 reflects data from 2023 to 2025. Measurements visibly affected by pumping conditions were excluded from analysis.

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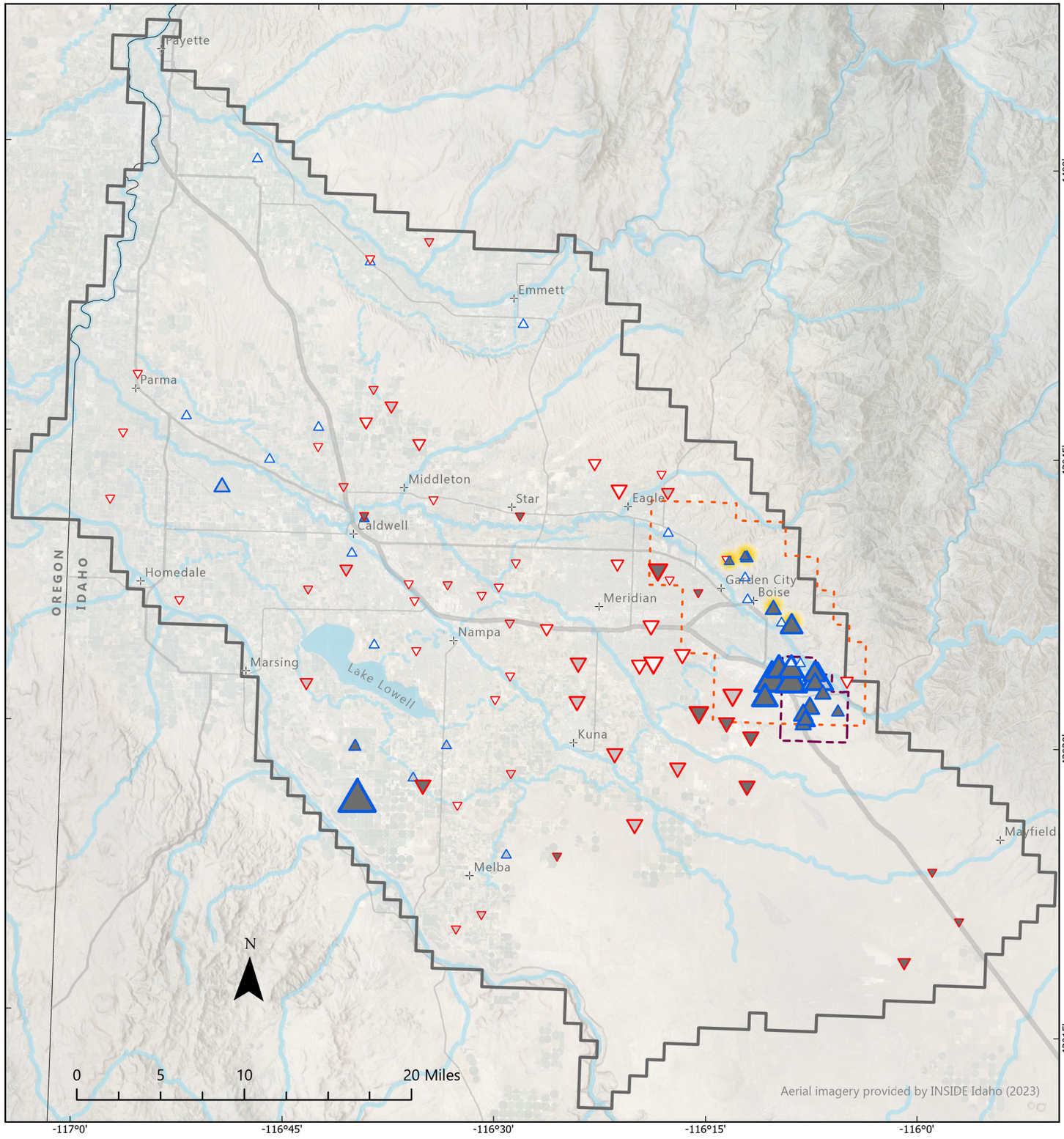
MAP CREATED FEBRUARY 2026



Treasure Valley Groundwater-Level Changes: 2021 to 2025

Magnitude of change (feet)

Decrease

- -107.6 to -100.1
- -100.0 to -90.1
- -90.0 to -80.1
- -80.0 to -70.1
- -70.0 to -60.1
- -60.0 to -50.1
- -50.0 to -40.1
- -40.0 to -30.1
- -30.0 to -20.1
- -20.0 to -10.1
- -10.0 to -5.1
- -5.0 to -0.1

Increase

- 0.0 to 5.0
- 5.1 to 10.0
- 10.1 to 20.0
- 20.1 to 30.0
- 30.1 to 40.0
- 40.1 to 50.0
- 50.1 to 60.0
- 60.1 to 70.0
- 70.1 to 80.0
- 80.1 to 89.5

Well completion depth for each well indicated by symbol fill color

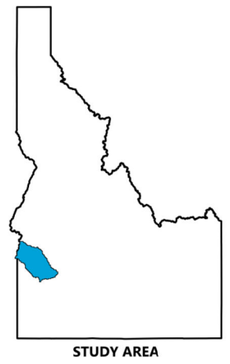
- Shallow [less than 200 feet]
- Intermediate [200 to 400 feet]
- Deep [over 400 feet]

Groundwater Management Areas (GWMA)

- Southeast Boise GWMA
- Boise Front Low-Temperature Geothermal Resource GWMA
- Geothermal wells inside the Boise Front GWMA surrounded with orange glow

Study Area

- Treasure Valley Groundwater Model Boundary (2023)



Groundwater level is the depth measured from the ground surface to the groundwater surface in a well. Changes in groundwater level are shown for **135 wells** to compare conditions from 2021 to 2025.

Measurements were from spring months (March to May) to minimize seasonal variations. Measurements visibly affected by pumping conditions were excluded from analysis.

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MAP CREATED FEBRUARY 2026