Idaho Department of Water Resources
Open-File Report

Summary of Groundwater Levels in the Grand View-Bruneau Groundwater Monitoring Network – 2011 Update

By
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January 2012

Introduction

The Idaho Department of Water Resources (IDWR) manages a groundwater-level monitoring network in the area encompassing Grand View and Bruneau, in Owyhee County of southwestern Idaho. The monitoring network currently consists of 18 wells that are measured on a monthly basis. The purpose of the groundwater monitoring program is to observe water levels within the Grand View-Bruneau Groundwater Management Area (GBGWMA) that was designated on October 29, 1982 (IDWR, 1982). Designation was based on concern that there was insufficient groundwater supply for existing irrigation uses or to fulfill pending applications and permits.

Groundwater conditions in the GBGWMA are summarized in several reports (Piper, 1924; Littleton and Crosthwaite, 1957; Ralston and Chapman, 1969; Young and Whitehead, 1975; Rightmire, Young and Whitehead, 1976; Young and Lewis, 1982; Berenbrock, 1993; Mink and Lockwood, 1995; Harrington and Bendixsen, 1998). A management plan has not been developed for the area nor has an advisory committee been formed. Currently, data from this monitoring network provide the primary source of information for the management of the groundwater resource in this area.

Purpose and Scope

The purpose of this report is to summarize the status of the groundwater monitoring network and present water-level data collected over the network's history.

Status of the Monitoring Network

Historically, up to 23 wells have been measured regularly in the monitoring network, and there are 67 wells with five or more water-level measurements. Currently, 18 of the 23 historic wells are being measured on a monthly basis (Figure 1). Table 1 summarizes the historical network and identifies the wells that are currently being monitored.

The oldest record in the network has monitoring data dating back to 1953. Wells included in the historic network that are no longer being monitored have been dropped from the network due to access restrictions or poor data quality (i.e., unreliable measurements).

Data for the active wells consists generally of monthly measurements. However, irrigation pumping or other temporary access restrictions result in short-term data gaps, typically during the irrigation season. Water-level data for the current monitoring network are displayed in Appendix A.

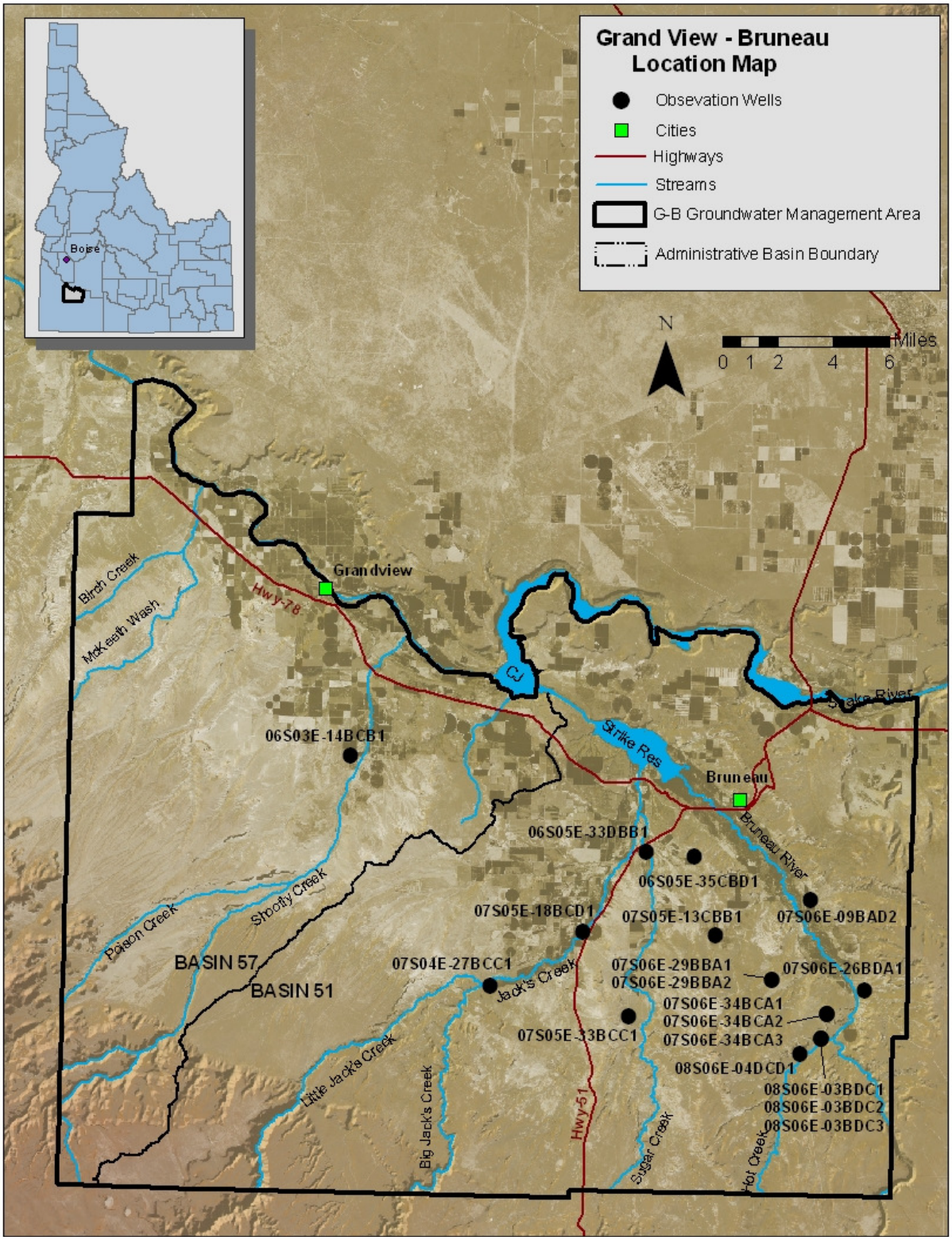

Figure 1. Grand View – Bruneau Groundwater Monitoring Network.

Table 1. Summary of the Historical Groundwater Monitoring Network for the Grand View-Bruneau Groundwater Management Area.

Well ID	Period of Water Level Record	Well Type	Current Monitoring Frequency
06S03E14BCB1	1953-2011	Monitoring	Monthly.
06S04E14ABC1	1957-2008	Irrigation	Dropped from network due to measurement difficulties (snags measurement equipment).
06S05E33DBB1	1953-2011	Domestic	Monthly.
06S05E35CBD1	1980-2011	Irrigation	Monthly.
07S04E27BCC1	1978-2011	Irrigation	Monthly.
07S05E13CBB1	1978-2011	Irrigation	Monthly.
07S05E18BCD1	1954-2011	Irrigation	Monthly.
07S05E19CCC1	1953-2000	Irrigation	Dropped due to access difficulties.
07S05E21CCA1	1978-2007	Irrigation	Dropped from network due to measurement difficulties (too much oil).
07S05E33BCC1	1994-2011	Domestic	Monthly.
07S06E09BAD2	1953-2011	Irrigation	Monthly.
07S06E26BDA1	1981-2011	Irrigation	Monthly.
07S06E29BBA1	1990-2011	Monitoring	Monthly.
07S06E29BBA2	1990-2011	Monitoring	Monthly.
07S06E34BCA1	1990-2011	Monitoring	Monthly..
07S06E34BCA2	1990-2011	Monitoring	Monthly.
07S06E34BCA3	1990-2011	Monitoring	Monthly.
07S06E34DAD1	1979-2002	Irrigation	Dropped from network due to access difficulties.
08S05E16AAA1	1989-2001	Stock	Dropped from network due to access difficulties.
08S06E03BCD1	1990-2011	Monitoring	Monthly.
08S06E03BCD2	1990-2011	Monitoring	Monthly.
08S06E03BCD3	1990-2011	Monitoring	Monthly.
08S06E04DCD1	1990-2011	Monitoring	Monthly.

Summary of Water Level Data

A review of the data from the wells in the current monitoring network was conducted to summarize the general water-level elevations, historic changes in water levels, recent (10-year) changes in water levels, and seasonal fluctuations experienced in each well. Analyses of the data from wells in the historic monitoring network that are no longer monitored were not conducted.

General Water Level Elevation Analysis

The Grand View-Bruneau area is underlain by a regional warm water aquifer system. This aquifer system is characterized by multiple confined and partially confined flow zones that exhibit increasing hydraulic head with depth. The construction of most wells in the network allows mixing, or hydraulic communication, between multiple flow zones.

This precludes the creation of a groundwater flow map using the monitoring network data because the observed water levels represent an unknown combination of flow zones.

Previous research in the area indicates that groundwater flow is generally south to north within the GBGWMA, and locally can vary from northeastward to northwestward (Littleton and Crosthwaite, 1957; Young and Lewis, 1982; Berenbrock, 1993).

Overall Water Level Changes

To evaluate the current conditions of the aquifer, analyses of water levels were conducted to determine the differences between the historic water levels and current water levels. No pumping water levels were included in the analyses. Eight of the 18 currently monitored wells in the network have been monitored since 1970. The water levels in all eight wells were lower in the spring of 2010 than they were in the spring of 1970. These wells show long-term water-level declines ranging from 2.4 to 36.0 feet (Table 2).

Nine of the 18 wells in the network only have data dating back to 1990, and all nine indicate lower water levels in 2010. These wells show long-term water-level declines ranging from 6.1 to 12.3 feet over the 20-year period.

Well 07S05E-33BCC1 was added to the network in 2008. The spring 2010 water level is approximately 35.8 lower than the water level recorded on the driller's report when the well was installed in 1994.

To facilitate comparison of long-term water-level behavior, water-level differences for the period 1990 - 2010 were evaluated for all wells in the network (Table 2). Sixteen of the currently monitored wells in the network indicate lower water levels in the spring of 2010 compared to water levels in the spring of 1990. These wells show a 20-year water-level decline of 4.6 to 17.0 feet. Wells 07S05E-18BCD1 and 07S06E-09BAD2 indicated positive water-level changes of 3.9 and 4.8 feet, respectively. Both wells exhibit long-term downward trends, although it appears that the lowest water levels in both of these wells occurred during the late 1980's and early 1990's.

Recent Water Level Changes

An analysis of the data collected over the past 10 years was conducted to evaluate any recent changes in water levels. All but one of the wells in the current network show water-level declines over the past 10 years. One well, 07S06E09BAD2, indicates an increase in water levels when comparing the spring 2000 water-level measurement to the spring 2010 measurement. The 10-year water-level differences are listed in Table 2 and illustrated in Figure 3.

Table 2. Summary of water-level changes for wells in the current monitoring network.

Well Number	Maximum Seasonal Water Level Change (feet)[1,8]	Minimum Seasonal Water Level Change (feet)[1,8]	Average Seasonal Water Level Change (feet)[1,8]	10-YR Water Level Change (feet)[2]	20-YR Water Level Change (feet)[2]	Overall Water Level Change (feet)[3,4,5,6,7]
06S03E14BCB1	-34.6	-0.6	-16.3	-17.0	-15.2	-36.0
06S05E33DBB1	-27.5	-0.2	-14.4	-4.2	-4.6	-5.3
06S05E35CBD1[4]	-68.5	0.4	-37.8	-7.1	-17.0	-4.2
07S04E27BCC1[4]	-7.8	-5.4	-6.5	-8.8	-12.6	-19.9
07S05E13CBB1[4]	-140.5	-1.6	-26.7	-7.9	-14.4	-19.3
07S05E18BCD1[5]	-22.7	-1.5	-9.9	-5.4	3.9	-25.1
07S05E33BCC1[6]	-2.5	-2.3	-2.4	NA	NA	NA
07S06E09BAD2	-45.2	-7.9	-25.2	4.3	4.8	-2.4
07S06E26BDA1[4]	-25.4	-3.5	-6.9	-14.5	-13.1	-14.7
07S06E29BBA1[7]	-6.8	-5.0	-6.0	-8.3	-9.9	-9.9
07S06E29BBA2[7]	-0.4	0	-0.16	-3.9	-6.1	-6.1
07S06E34BCA1[7]	-6.0	-4.5	-4.9	-8.4	-11.4	-11.4
07S06E34BCA2[7]	-6.0	-4.0	-4.9	-7.8	-10.7	-10.7
07S06E34BCA3[7]	-6.2	-3.4	-5.2	-8.8	-11.5	-11.5
08S06E03BCD1[7]	-6.2	-4.1	-5.2	-8.5	-12.3	-12.3
08S06E03BCD2[7,8]	NA	NA	NA	-8.6	-12.0	-12.0
08S06E03BCD3[7]	-5.5	-0.9	-3.8	-6.5	-6.7	-6.7
08S06E04DCD1[7]	-6.8	-3.5	-5.7	-8.5	-11.8	-11.8

1. Seasonal fluctuations represent the difference between non-pumping March and September water levels within a given year.
2. 10-Year water-level changes represent the difference between the non-pumping March 2010 and 2000 water levels.
3. The overall water-level change represents the difference between the non-pumping March 2010 and the March 1970 water levels.
4. The overall water-level change represents the difference between the non-pumping March 2010 water level and the earliest spring water level for wells without data reaching back to 1970.
5. The overall water-level change was calculated using March 2010 and March 1967 data.
6. Well added to network in 2008.
7. The overall water-level changes were calculated using the 1990 and 2010 March water levels.
8. Since 2007, well is dry for at least six months every year.

On average, water levels in the GBGWMA area have declined 7.6 feet in the past 10 years, resulting in an average decline of 0.76 feet/year. These declines are apparent in all but one of the monitoring wells in the current network (07S06E-09BAD2), indicating the water-level decline is regional in extent. The historic water-level analysis indicates the regional aquifer is in a continued state of decline, and has yet to reach equilibrium in terms of recharge and discharge.

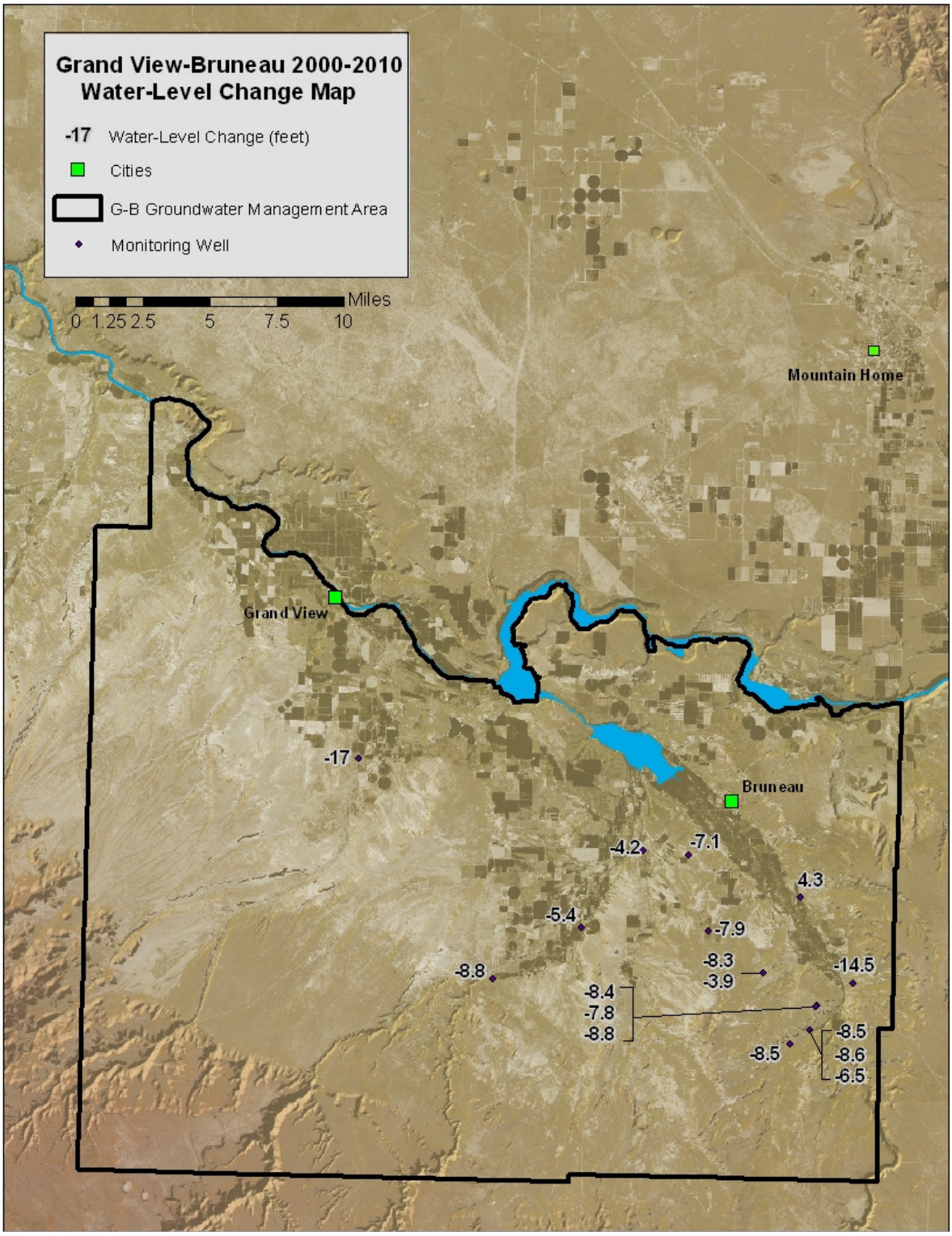

Figure 3. Water-level change map for the GBGWMA from 2000 to 2010. Locations with multiple values indicate well nests or multiple wells located very near to each other.

Seasonal Fluctuations

Seasonal responses to aquifer pumping and recharge are apparent in the hydrographs for each well. In general, the hydrographs show similar timing in responses to pumping and recharge events, with the seasonal high occurring in spring and the seasonal low in the fall (Figures 4 and 5). Wells in the western part of the GBGWMA generally exhibit larger fluctuations than wells to the east. The maximum, minimum, and average seasonal fluctuations for each well were determined by finding the difference between the March and September (spring and fall) measurements (Table 2). The maximum seasonal fluctuation was experienced by well 07S05E-13CBB1, which declined 140.5 feet between March of 2000 and September of 2000. One well (07S06E-29BBA2) does not exhibit significant seasonal variability, but in general, all of the wells show some degree of seasonal fluctuation, with an average change of 10.7 feet per season.

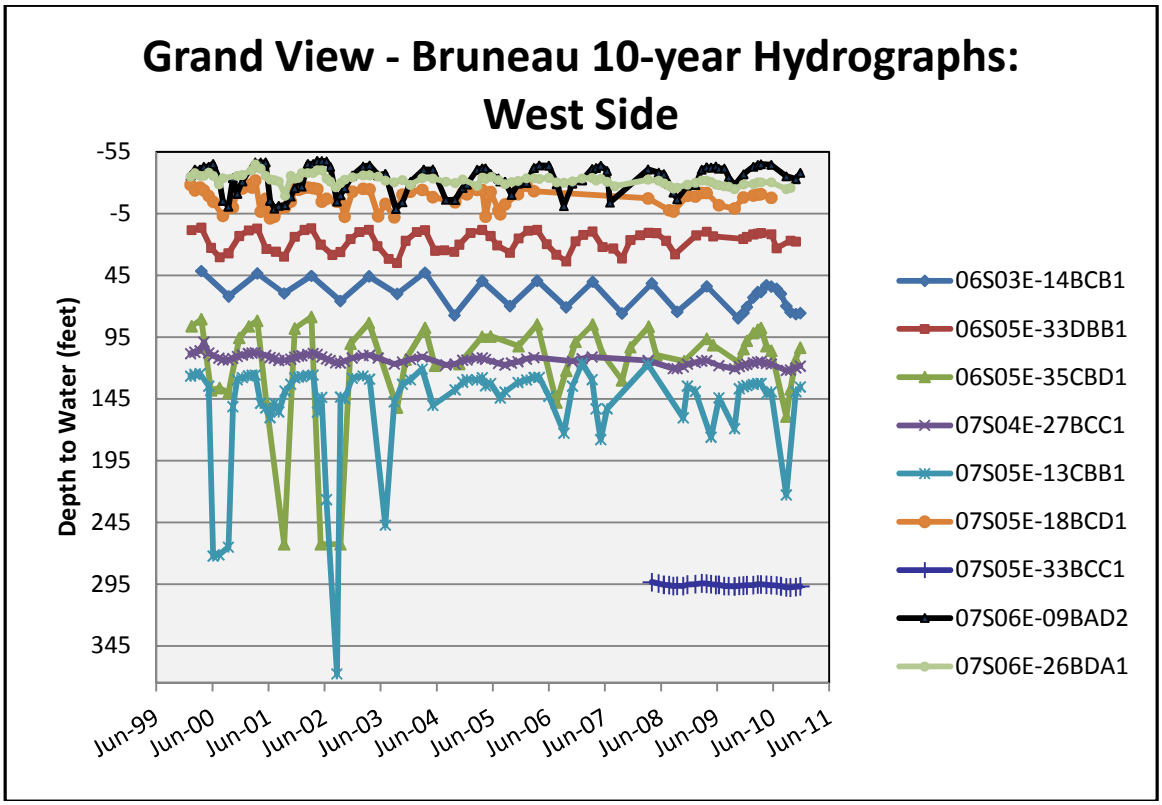

Figure 4. Hydrographs for wells in western portion of the Grand View-Bruneau Groundwater Monitoring Network for the period 2000 - 2010.

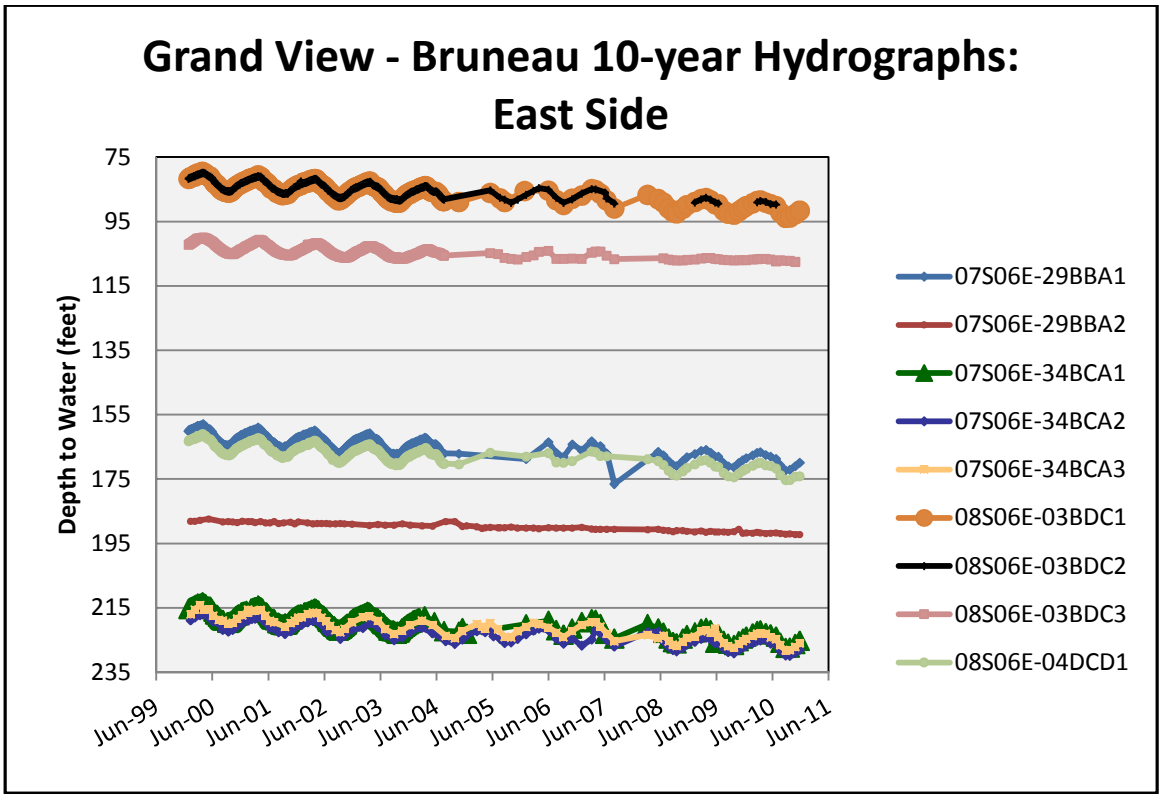

Figure 5. Hydrographs for wells in the eastern portion of the Grand View-Bruneau Groundwater Monitoring Network for the period 2000 - 2010.

Summary

The data collected from the GBGWMA groundwater-level monitoring network indicates that water levels in the area are declining at an average rate of 0.76 feet per year for the period 2000-2010. The most significant declines have occurred toward the northwest, near Grand View, and in the southeast corner of the study area near the confluence of the Bruneau River and Hot Creek. Continuation of this monitoring effort is essential for evaluating the water-level declines and to ensure that more significant water-level declines do not occur within the management area.

Recommendations

Based on the coverage of the current monitoring wells, it is recommended that at least one more monitoring well be incorporated into the northern portion of the monitoring network between Grand View and Bruneau to replace a discontinued well. One or more additional wells in the northwestern portion of the GBGWMA would provide more complete monitoring of the aquifer throughout the management area.

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APPENDIX A

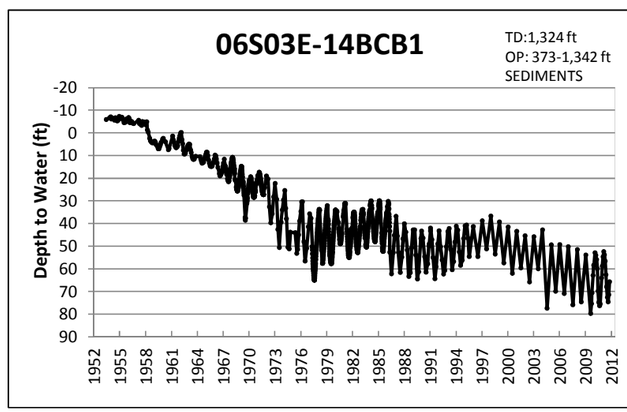
HYDROGRAPHS OF CURLEW VALLEY MONITORING NETWORK

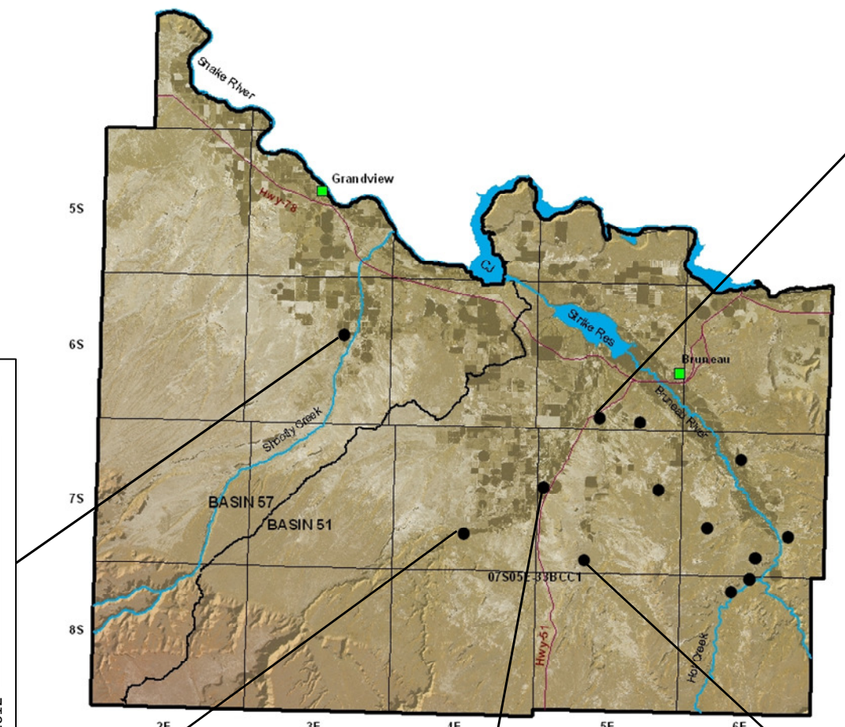
Grandview-Bruneau Hydrographs – West Area

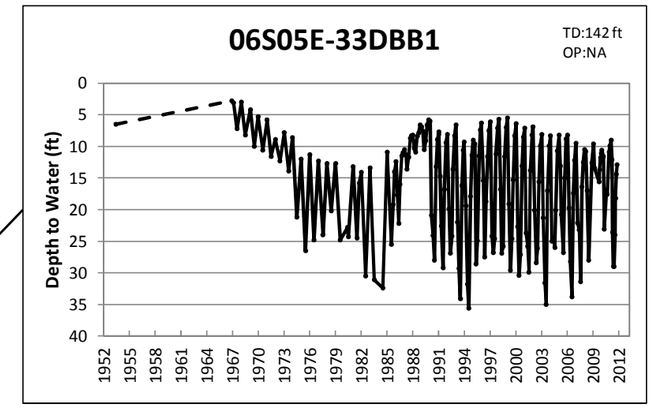
HYDROGRAPH LEGEND

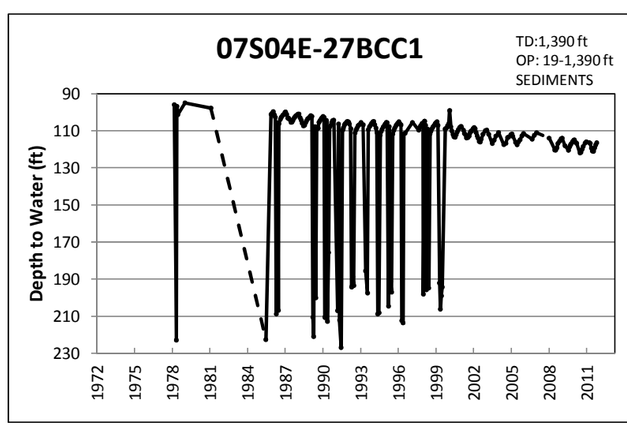
TD: Total Depth
OP: Interval that well is open to aquifer
VOLCANICS: Water Bearing Lithology

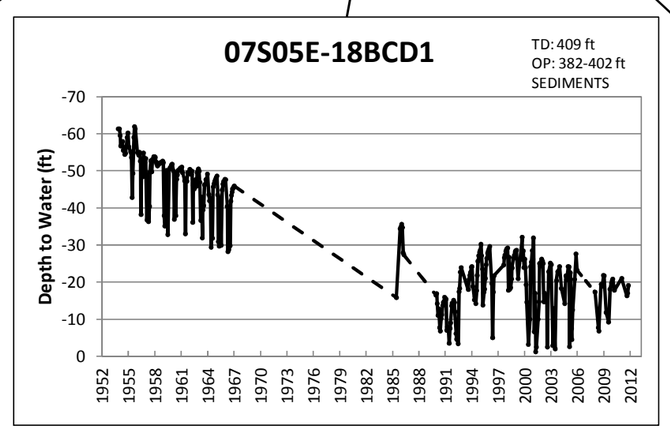
_ _ _ Indicates more than one month between measurements

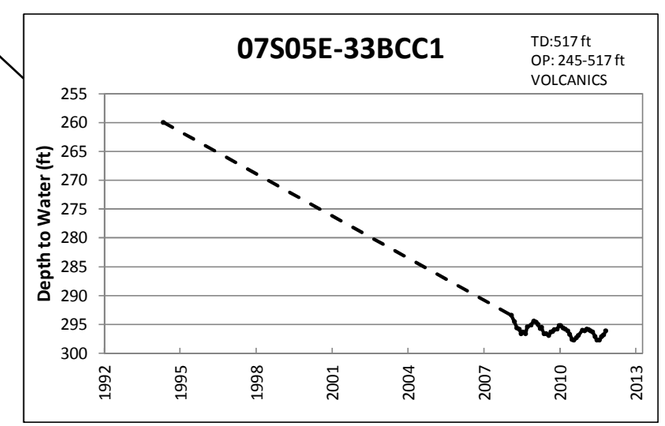










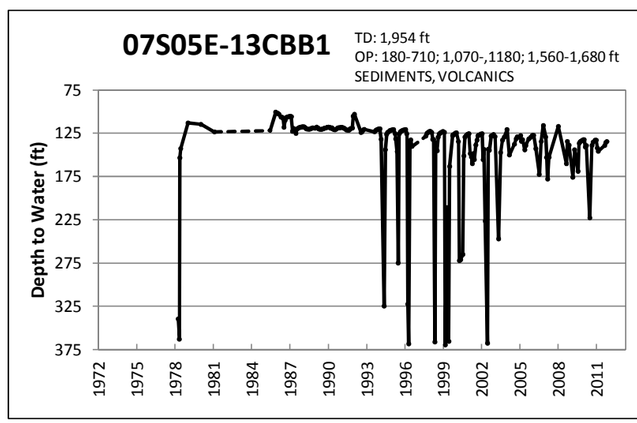


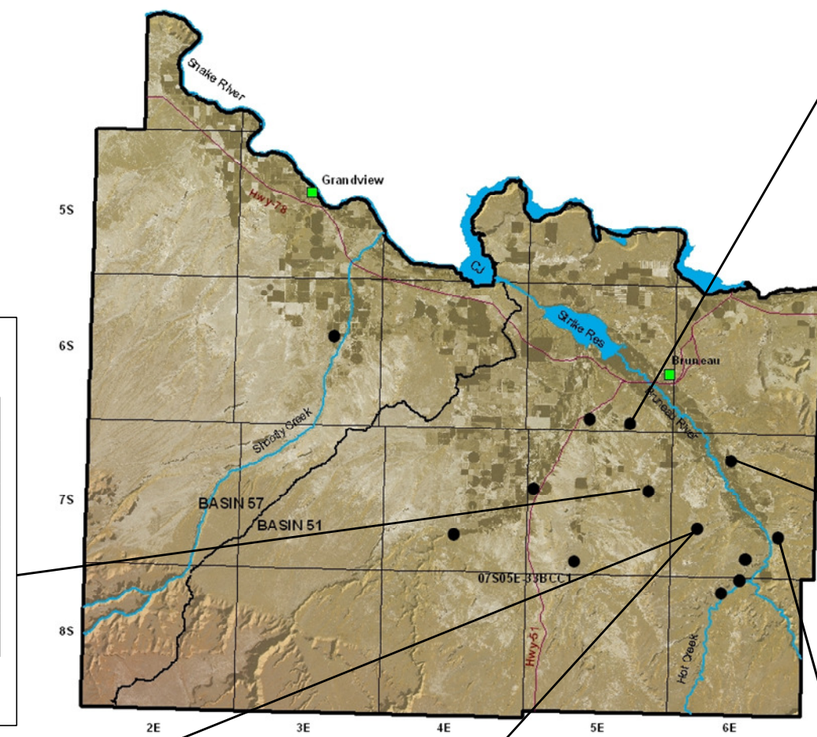
Grandview-Bruneau Hydrographs – East Area

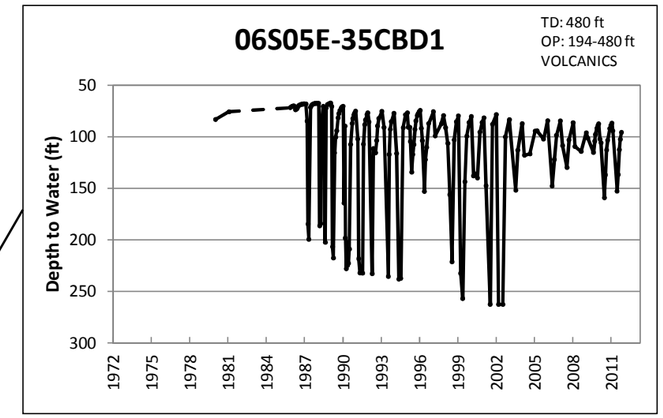
HYDROGRAPH LEGEND

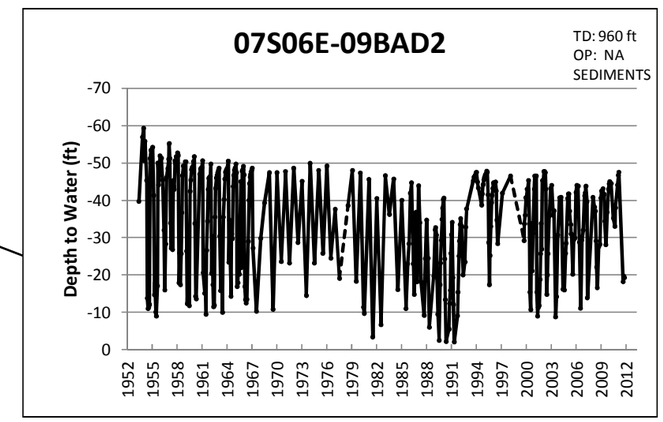
TD: Total Depth
OP: Interval that well is open to aquifer
VOLCANICS: Water Bearing Lithology

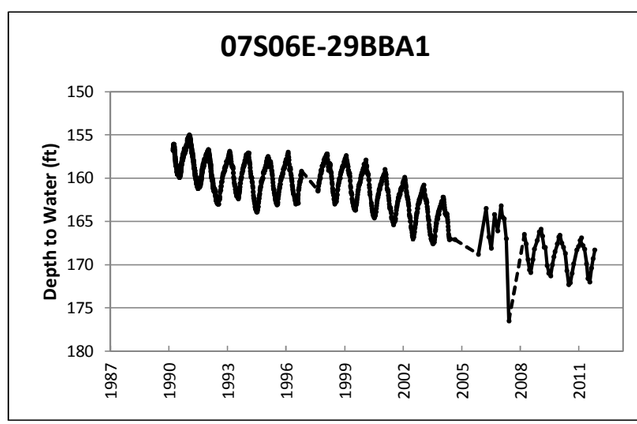
_ _ _ Indicates more than one month between measurements

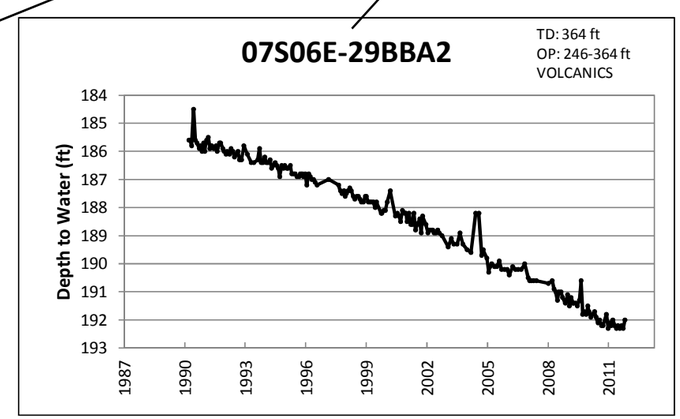


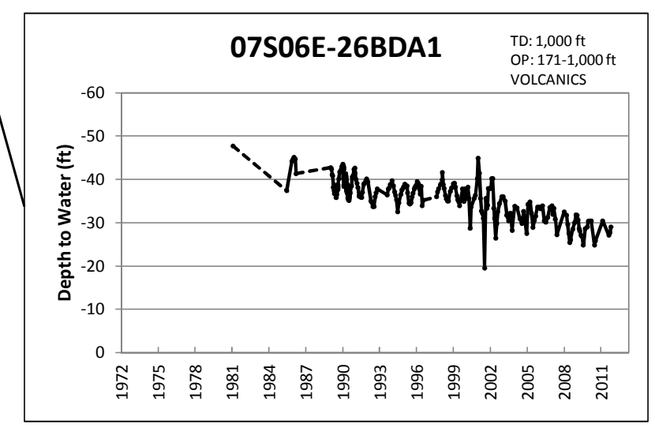






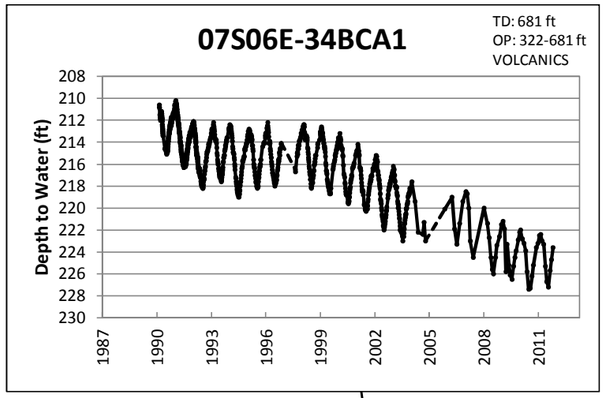
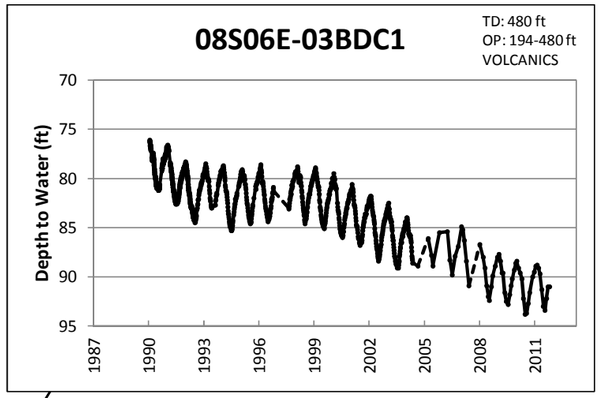
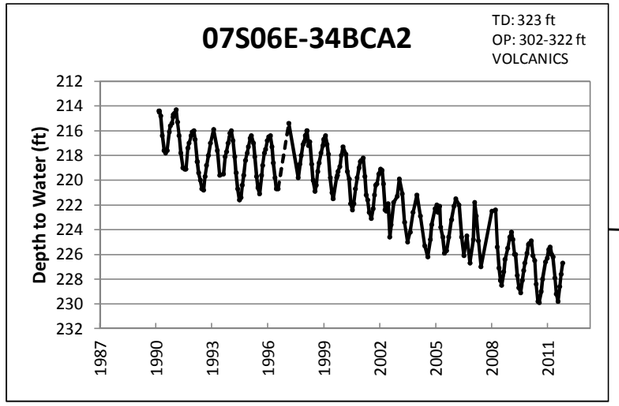
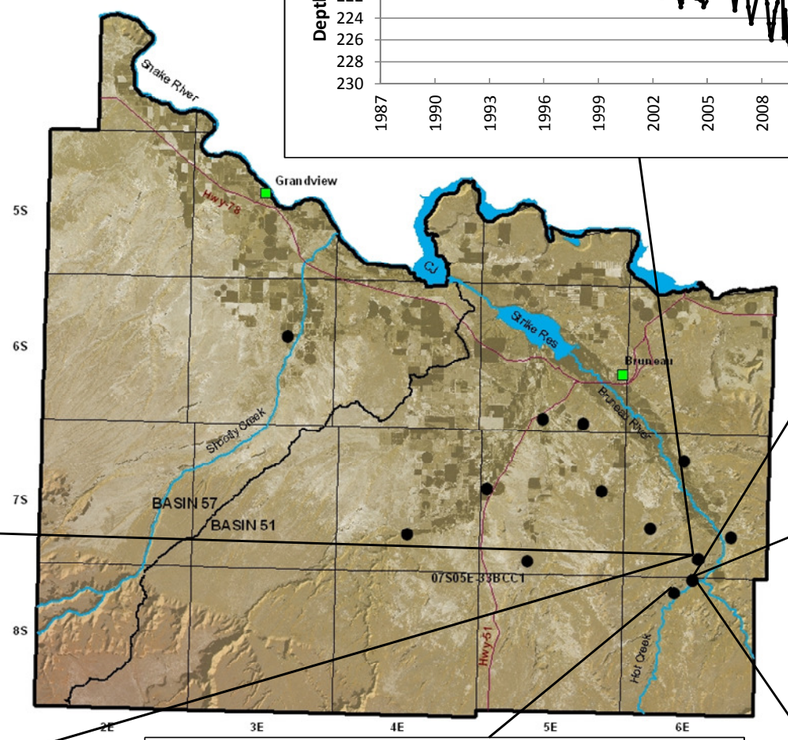
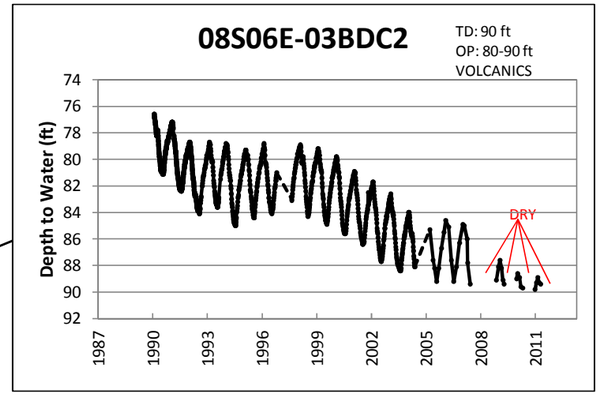
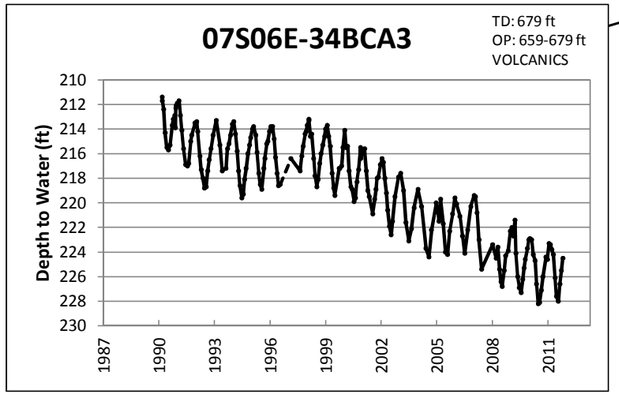
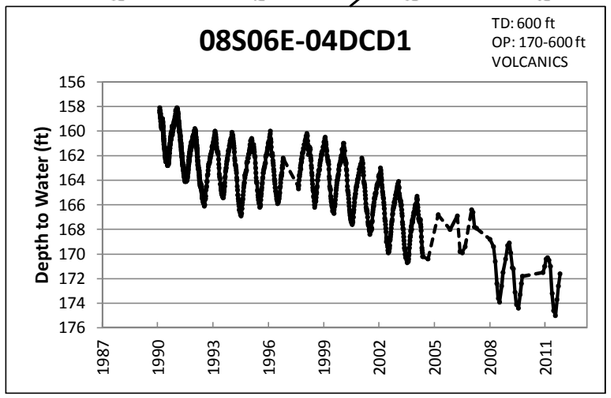
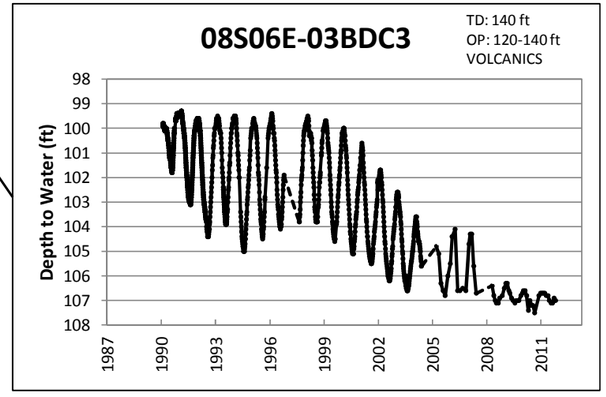






Grandview-Bruneau Hydrographs – Bathtub Area

HYDROGRAPH LEGEND

TD: Total Depth
OP: Interval that well is open to aquifer
VOLCANICS: Water Bearing Lithology

_ _ _ Indicates more than one month between measurements