SUMMARY OF GROUND-WATER CONDITIONS
IN THE
CURLEW VALLEY CRITICAL GROUND WATER AREA
IN ONEIDA AND POWER COUNTY, IDAHO

by
Shane Bendixsen

Idaho Department of Water Resources
Boise, Idaho

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INTRODUCTION

HISTORY

Curlew Valley is an agricultural community that began development approximately at the turn of the century. Surface water was originally developed, while extensive ground water development began in the 1950's. Both surface and ground water are now used for irrigation. In the 1970's permit applications for further development of ground water created concern of possible overdraft conditions within the Idaho side of the valley. The overdraft conditions could have possibly impacted a wildlife refuge in Utah (Locomotive Springs) and created non-economic pumping conditions in Idaho. Based on these possibilities, the Idaho Department of Water Resources (IDWR) conducted an investigation. The February, 1976, open file report, no author, could not definitively address all possibilities due to lack of data, but did recommend that the valley be designated as a "Critical Ground Water Area" (CGWA). Basis for this was that, "existing licensed and permit rights can potentially develop the portion of natural recharge as yet undeveloped" (IDWR, 1976). Therefore, on March 15, 1976 director Keith Higginson of the IDWR declared the Idaho portion of Curlew Valley a CGWA.

It is noted that the area was declared a CGWA not because overdraft conditions existed, but because the "potential" for overdraft conditions existed. Since that time no other investigations have been completed.

PURPOSE AND SCOPE

The purpose of this report was to review available data and evaluate changes that have taken place in Curlew Valley since the 1976 investigation.

Scope of work included a field reconnaissance of the area, a review of previous investigations and other literature, analyses of more than 60 well drillers reports, and compilation of ground water hydrographs dating back to 1970. The main focus of this report addresses the portion of the valley located in Idaho.

SITE DESCRIPTION AND LOCATION

The study area is the valley portion of the basin in Idaho (see Figure 1 "Site Location Map"). In Idaho, the locations are Townships 11, 12, 13, 14, 15, and 16 South, Ranges 31, 32, 33, and 34 East. The area encompasses approximately 250,000 acres within the State of Idaho ranging in elevation from approximately 4000 feet on the valley floor to 7000 feet in the surrounding mountains.

Annual precipitation varies from approximately 25 inches in the northern mountainous part of the area to 12 inches on the southern valley floor. Drainage is primarily south in Deep Creek, a perennial stream which fills Curlew Valley (also referred to as Stone) Reservoir. All other streams in the area are ephermal.

Farming and ranching is the sole industry with the major crops being alfalfa, cereal grains, seed potatoes, and minor amounts of rape seed. Dry farming is prevalent in the surrounding foothills while irrigated land is restricted to the valley floor.

Government set aside programs such as the Conservation Recovery Program (CRP) have taken approximately 30 percent of the dry farmed land out of production. Very little if any land irrigated with ground or surface water has been taken out of production (per. com. Mr. Mont Price, November 8, 1993, Agriculture Stabilization and Conservation Service (ASCS), Malad, Idaho office).

Most of the irrigated land is in the southern part of the area and along Deep Creek. Most of the irrigation wells are located south of Township 13 South and within two to three miles of Deep Creek.

Hydrologic records are limited for the basin. Precipitation was measured intermittently at Stone from 1908 to 1911, but not since. There are no snow courses in the basin. Spring snow water equivalent records for the Sublett course, located approximately 25 miles northwest of the area, are shown on Figure 3. Miscellaneous measurements of Rock Creek were made from 1962 to 1967 and a few measurements have been made at various locations along Deep Creek. There are no storage records for Curlew Valley Reservoir. Five wells that are monitored by the USGS (three in Idaho and two in Utah) on a semi-annual basis, provide a basis for monitoring ground water level trends.

PREVIOUS INVESTIGATIONS

Previous investigations have been completed by Thompson and Faris, (1932), Nace (1952), Bolke and Price (1969), Chapman and Young (1972), Baker (1974) and IDWR (1976,). By far the most detailed geologic and hydrogeologic descriptions were Chapman and Young (1972) and Baker (1974). The 1976 IDWR report dealt with farm economics, economic pump lifts, and water rights. It was this report that provided the basis for CGWA status.

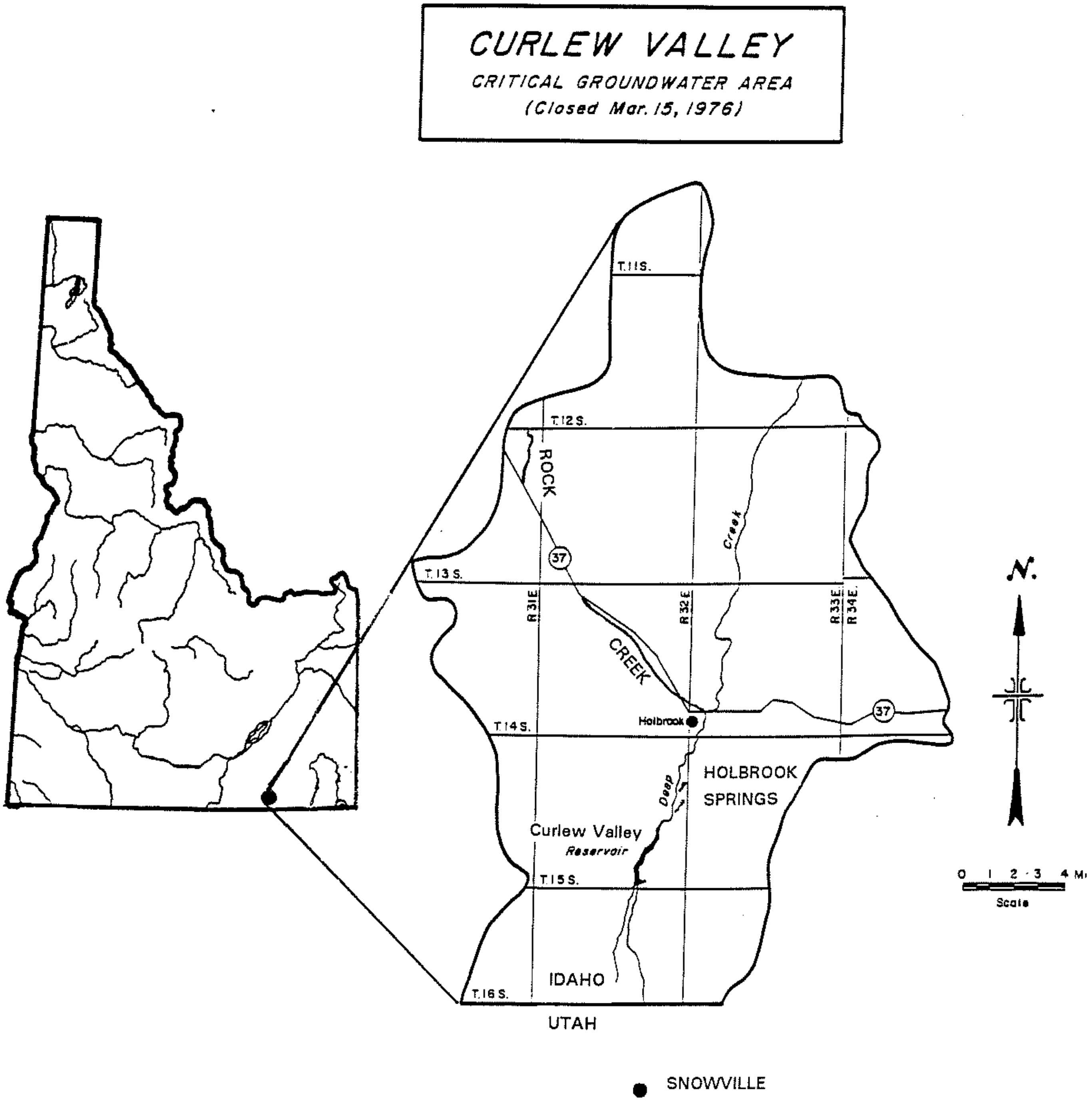


Figure 1. Site Location Map

REGIONAL AND LOCAL GEOLOGY

The following summary is a brief geologic description as presented by Chapman and Young (1972).

Curlew Valley and the surrounding area can be divided into two basic rock types or classes: bedrock or consolidated deposits and unconsolidated sediments.

The consolidated deposits consist primarily of Paleozoic limestone, dolomite, quartzite, sandstone, and shale. These rocks transmit and store limited quantities of water.

The unconsolidated deposits consist primarily of Quaternary alluvium and lakeshore deposits. These rocks can store large quantities of water and transmit little to large quantities of water. Where coarse, unconsolidated deposits are encountered, well yields are generally quite high.

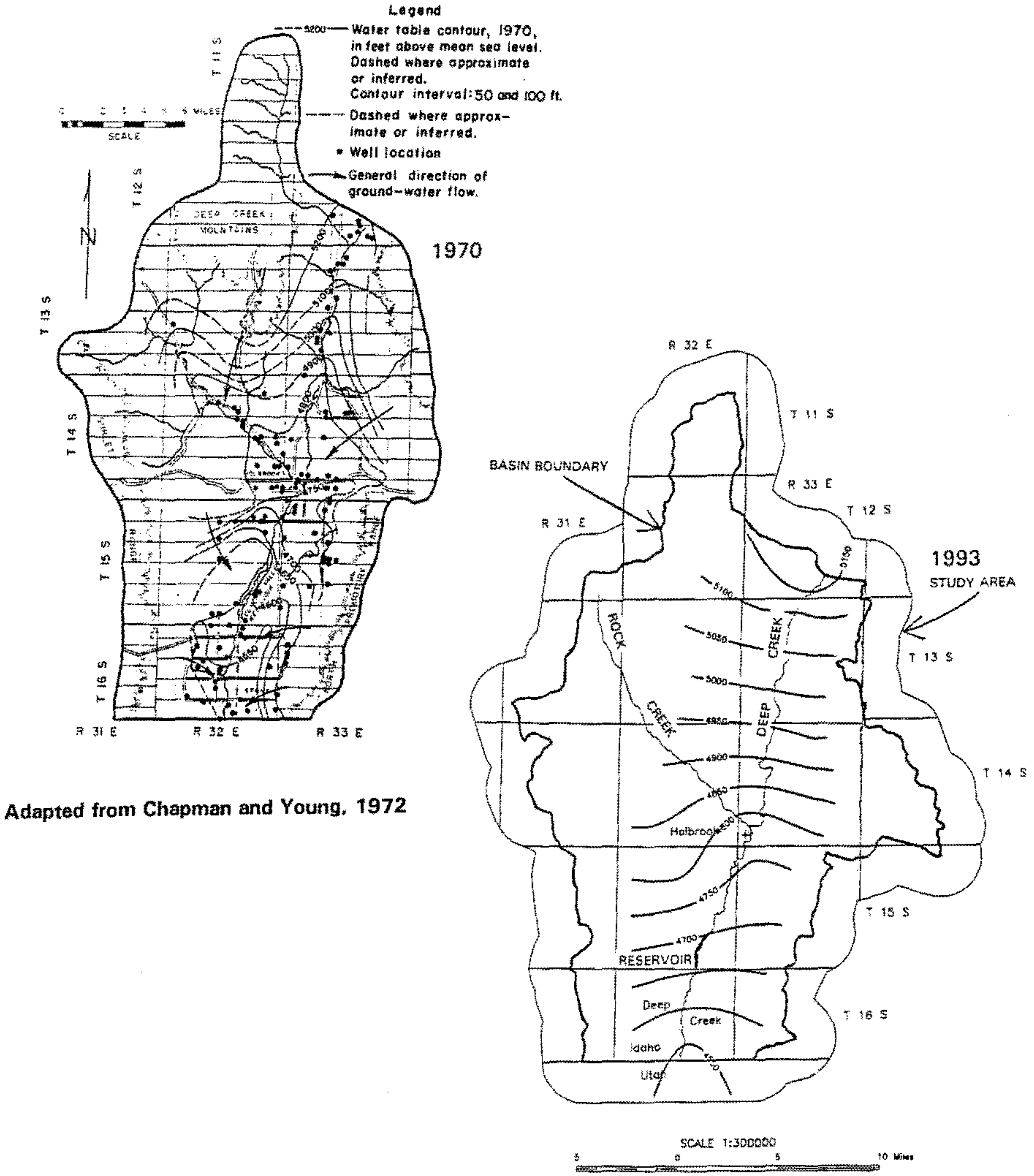
Locally, Curlew Valley is filled with sediments left from Lake Bonneville. Geophysical evidence suggests bedrock may be as much as 5,000 feet below the valley floor.

HYDROLOGIC REGIME

OCCURRENCE AND MOVEMENT OF GROUND AND SURFACE WATER

Ground water flow is primarily from north to south. Figure 2, "Ground Water Elevations", presents ground water elevations based on water level data collected in 1970 and the early 1990's. The 1970 data was a mass measurement conducted by Chapman and Young, (1972) and in essence is much more detailed. The recent contours are based on only six sample points or wells measured. As presented, the gradient is relatively steep in the northern part of the area or the uplands and then becomes gentler on the valley floor or to the south. Apparently, Curlew Valley Reservoir provides recharge to the immediate area producing a flat gradient. The aquifer has two major areas of natural discharge; Holbrook Springs above the Reservoir and Locomotive Springs in Utah located approximately 22 miles south of the Idaho border.

The area can be divided into two different drainage basins: the western basin drained by Rock Creek and the eastern basin drained by Deep Creek. Rock Creek is normally dry for several miles above its confluence with Deep Creek. Above this point it does have an estimated perennial spring flow of about 1 cubic foot per second (cfs). Deep Creek maintains an annual flow of 25 to 35 cfs. The majority of this flow issues from the Holbrook Springs (Township 15 South, Range 32 East, Sections 12 and 13). The



Adapted from Chapman and Young, 1972

Figure 2. Ground Water Elevations

USGS made measurements of the springs in the 1930's which were similar to a measurement made in 1970. Therefore, the springs discharge appears to be constant over time (Chapman and Young, 1972).

This drainage from Deep Creek, or spring flow, fills Curlew Valley Reservoir. During the field reconnaissance the reservoir was approximately half full and filling. Conversations with some of the area residents confirms Chapman and Youngs 1972 observations. The reservoir has consistently refilled during the fall and winter months.

In their 1972 investigation, Chapman and Young also conducted a pump test in the southern portion of the area (T16S-R32E-S27). One production well was used with five monitoring wells. Duration of the test was 48 hours of production with 27 hours of recovery. Transmissivity values from the production well data varied from 60,000 gpd/ft (8,000 ft^2/d) at the beginning of the test to 30,000 gpd/ft (4,000 ft^2/d) towards the end. Transmissivity values in the observation wells were as high as 4,260,000 gpd/ft (570,000 ft^2/d). The differences were attributed to weakly artesian or confined conditions, non-uniform aquifer material, boundary effects, and partial penetration effects.

For this study, approximately 65 well drillers reports were reviewed. The aquifer description given by Chapman and Young (1972) fits well with what was observed in the well drillers reports. Well yields vary greatly within short distances depending upon lithologies encountered.

Well yields range from 3,600 gallons per minute (gpm) to a few gpm, with some boreholes taken to a depth of over 400 feet with little or no water encountered. A well attempted in T13S-R32E-S02 was taken to a depth of 240 feet with only a "trace of water" encountered. It is assumed that since this was to be a domestic well, the "trace of water" was an extremely low quantity. Another well attempted at T13S-R32E S22 was taken to a depth of 460 feet with no water encountered. While most boreholes in the area do encounter water in production quantities, well drilling in Curlew Valley apparently can be extremely variable.

RECHARGE vs. DISCHARGE

While sufficient data were lacking, both Chapman and Young (1972) and Baker (1974) made estimates for recharge and discharge. Chapman and Young estimated basin water yield at approximately 36,000 acre feet per year (AF/Y) with 6,000 AF/Y being consumptively used for irrigation. The remainder flows into Utah: 18,000 AF/Y in underflow and 12,000 AF/Y in surface flow. Baker's estimate was approximately the same with the basin water yield at 44,000 AF/Y. There are no additional data now available, to provide a basis for modifying these estimates.

Figure 3, "Sublett Snow Course Data" presents the cumulative departure and the raw data from the Sublett Snow Course located northwest of the basin. Snow course data, in this area, should be representative of ground water level trends in Curlew Valley. Spring run off from snow melt should be providing the bulk, if not all of the ground water recharge. Cumulative departure should be the most representative, based on that ground water is an accumulation on previous events. The trend seen here is a rise until the mid 1970's, decreasing levels until the approximately 1981, increasing levels until 1986, and then decreasing levels until present associated with the recent drought.

Figure 4, "Curlew Valley Hydrographs" presents the hydrographs and locations of the three long term wells monitored by the USGS. Ground water level measurements are made semi-annually in the spring and fall. Location of the three wells also permits monitoring of almost the entire area with locations in the northeastern, in the south central, and in the very southern part of the area.

As presented the hydrograph for well 13S33E-04ADD1 is somewhat typical. It is also noted, although not shown, that the same well had another measurement taken in 1947 that placed the water level at 81.6 feet below land surface. In 1986 the water level reached a high of 41 feet below land surface. Therefore, in the northern part of the basin, ground water levels have fluctuated as much as 40 feet between dry and wet periods. The 1993 fall measurement was approximately eight feet above the 1970 measurement when regular monitoring began.

Well 15S32E-09AAA2 is atypical in that it shows a small but steady decline from 1970 to 1986, a leveling off or steady-state period through 1991, and then an apparent decrease until present. It is noted that the small, sharp declines and raises are probably pump cycles associated with adjacent wells. More importantly though, is that none of the typical trends are present. This could be explained by noting its location. It is approximately located in the transition zone where the gradient becomes gentler. This is also northwest of Holbrook Springs and Stone Reservoir. This infers that water level changes may be masked due to some type of flow restriction or blockage (ie a lithologic change) associated with the springs. In any event, there are no large water level declines that would suggest overdraft conditions are present.

Although not readily apparent, typical water level trends (indicated by hash marks) are present for well 16S32E-27DAB1. Increasing levels until the mid 1970's, decreasing water levels until approximately 1980, rising water levels until approximately 1986, or before the start of the recent drought, followed by decreasing water levels until 1993 are present. This hydrograph should also be the most representative based, on its location.

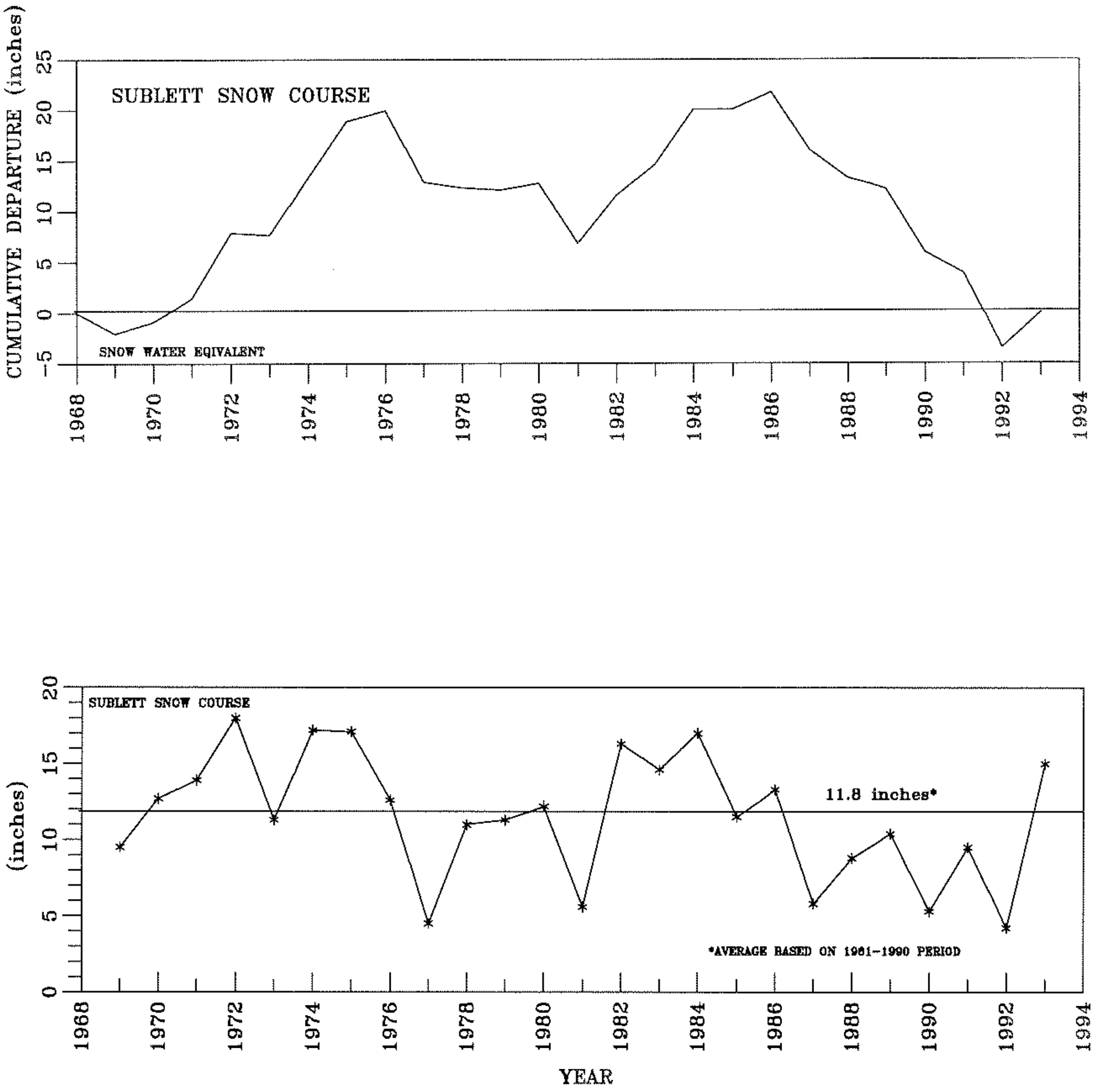


Figure 3. Sublett Snow Course Data

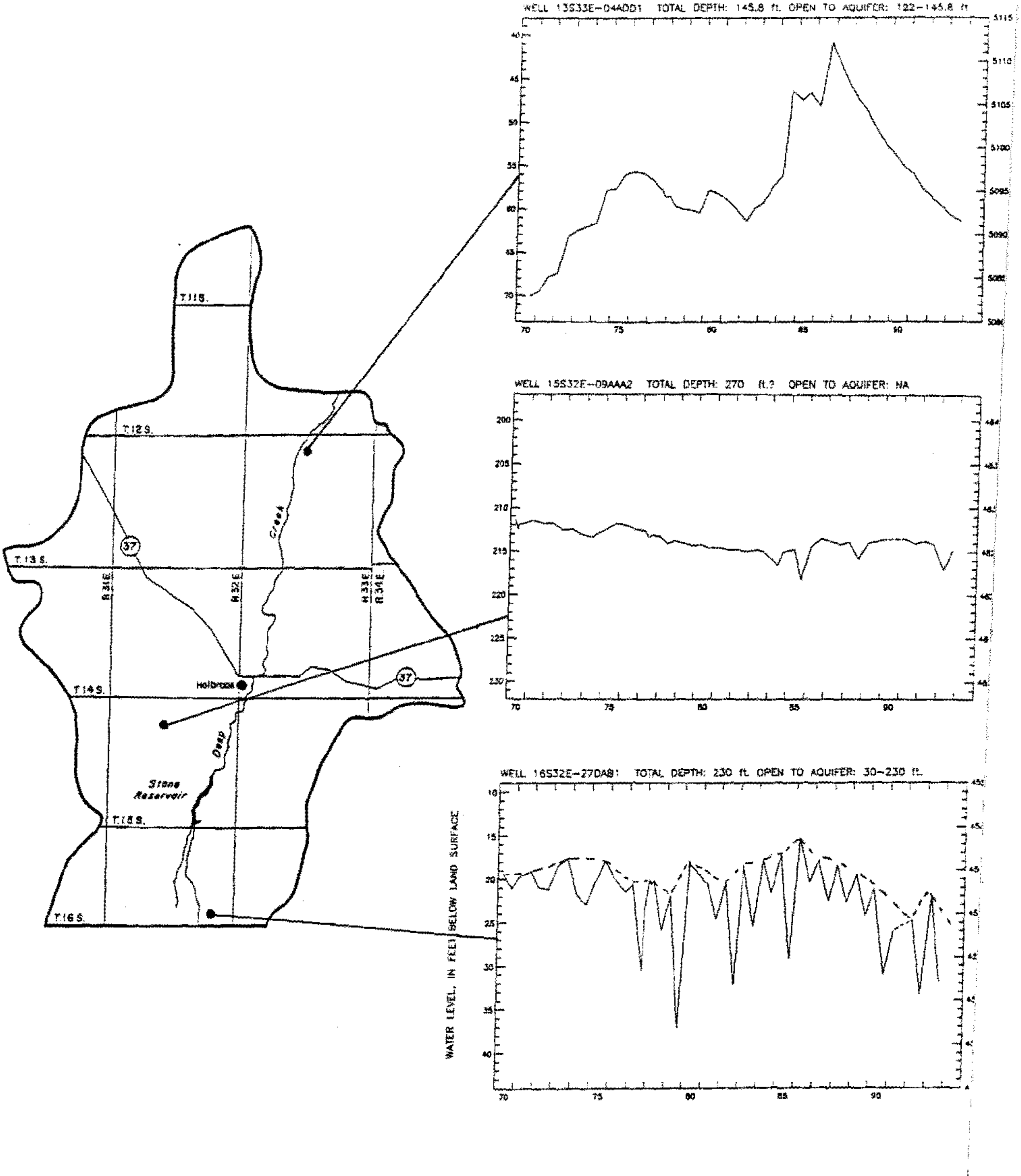


Figure 4. Curlew Valley Hydrographs

Two of the above mentioned wells show seasonal trends correlating with high and low level measurements. The well farthest to the north (13S33E-04AAD1) (although not readily apparent in the hydrograph) has its highest water level in the fall. This is characteristic of an area of low water usage with the highest water level mark corresponding to the spring runoff. This correlates well with what was observed during the field reconnaissance: mostly dry farms with limited irrigation development. The well furthest to the south (16S32E-27DAB1) has its highest water level in the spring. This infers an area of high water usage in the summer and then recovery throughout the fall and winter. This again correlates with what was observed in the field: mostly irrigated crop land. The well located south central shows no link with a particular time of year and a high or low water level.

Figure 5 "Utah Well Hydrographs" presents hydrographs for two wells and their locations on the Utah side of Curlew Valley. Both hydrographs are only current to the spring of 1993. Due to budget cut backs in the State of Utah, the wells for an undetermined amount of time will only be measured annually in the spring. It is noted that the time frame presented differs from the hydrographs presented for the Idaho side of Curlew Valley. Data was available dating back to 1955 versus 1970 for the Idaho side.

Well (B-14-9) 7bbb-1 is approximately located 10.5 miles west of Snowville. While an overall downward trend is seen from the 1960's to present, typical trends are still present. A rising trend in the early 1970's, a decreasing trend until approximately 1980, and then increasing trends until approximately 1984, are present. The sharp decrease until present is unexplained. The well may have been re-equipped for increased production or another nearby well may have begun pumping. Prior to the precipitous drop in 1991-1992, it appeared that the aquifer was approaching an equilibrium condition in response to development in the 1960's.

The hydrograph for well (B-12-11) 16adc-1 also has an overall slightly downward trend, but is typical with decreases and increases similar to the Sublett Snow Course data.

CONCLUSIONS

Based on the above discussion, Curlew Valley, Idaho is not in overdraft. Ground water level changes correspond to climatic changes which would be expected in an area of limited ground water development. If overdraft conditions did exist, then ground water levels should remain constant or even decline during wet climatic periods (ie discharge exceeding recharge). This is not observed in any of the monitoring wells. The wells also respond seasonally, correlating to the areas in which they are located. This increases confidence that measurements taken from them are representative of current aquifer conditions. Therefore monitoring of the wells should continue.

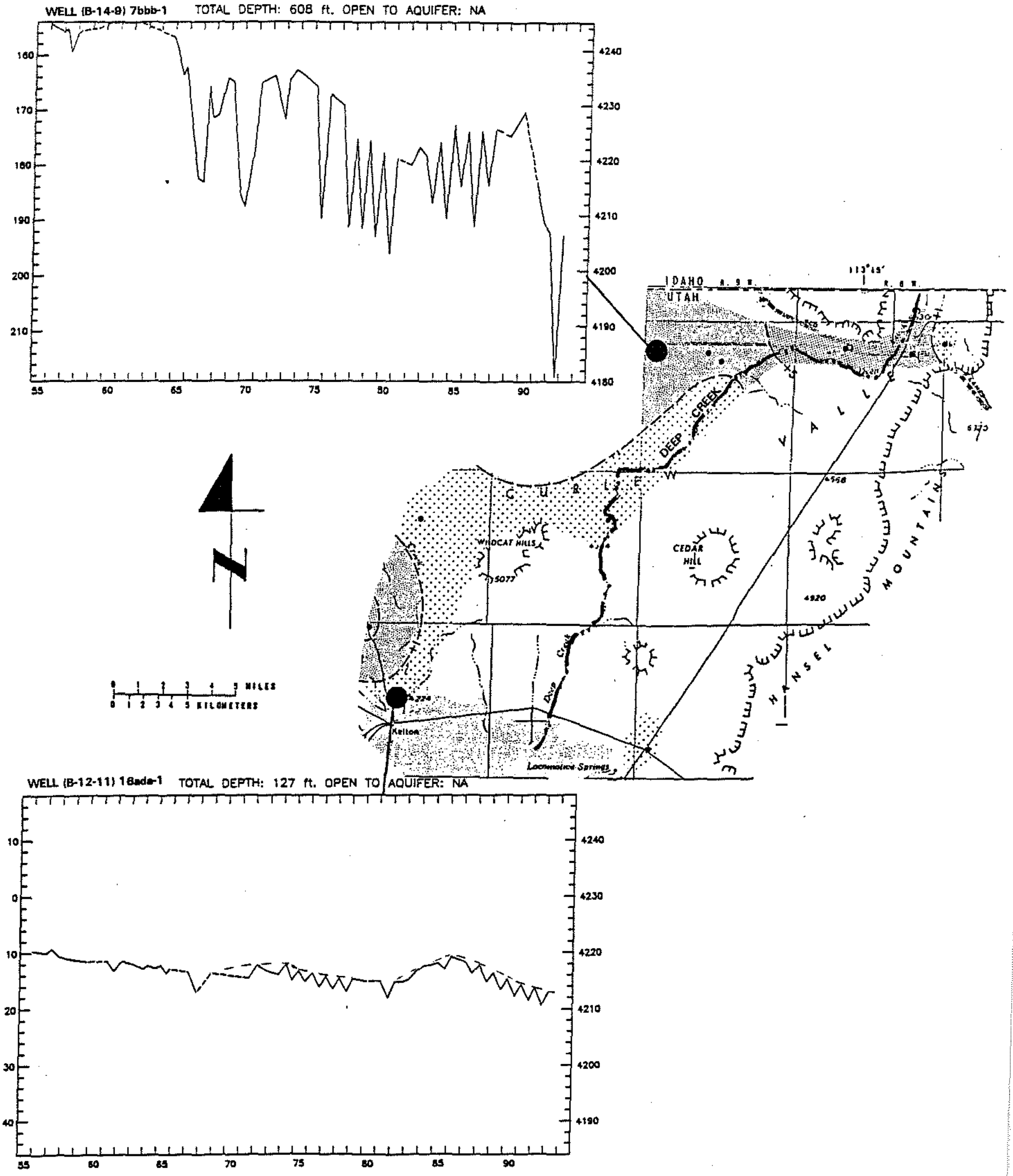


Figure 5. Utah Well Hydrographs

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