INCENTIVES FOR GROUNDWATER MANAGEMENT IN THE NORTHERN SACRAMENTO VALLEY

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INTRODUCTION

Reliance upon groundwater in the northern Sacramento Valley (Tehama, Glenn, Butte, Colusa, and Shasta Counties) is on the rise. The extent that groundwater extraction has increased and the reasons for the increase may be surprising. This article gives a brief historic perspective of how reliance upon groundwater has changed in the northern Sacramento Valley over the past 30 years and discusses a variety of factors that have contributed to a greater reliance upon groundwater. It provides a glimpse of groundwater levels in the northern Sacramento Valley and emphasizes that groundwater levels vary depending upon local groundwater use, surface water availability, short-term weather and long-term climatic conditions, and location. This article concludes by introducing an approach to groundwater management that emphasizes local management based upon scientific monitoring of groundwater conditions.

TRENDS IN GROUNDWATER USAGE

Figure 1 shows the cumulative number of water wells grouped by use that have been constructed each year from 1970 through 2002 in the northern Sacramento Valley. These data are based upon Water Well Completion Reports, submitted to the California Department of Water Resources, Northern District by licensed well drillers.

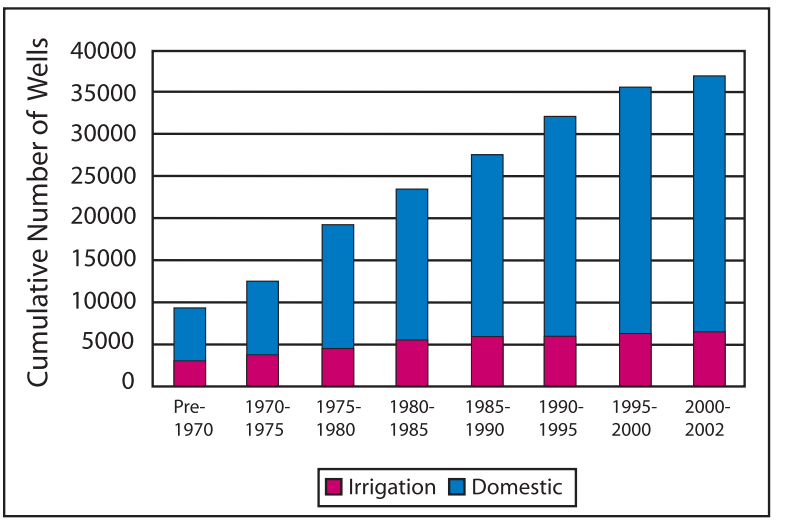

Figure 1. Total number of water wells, grouped by use, in the northern Sacramento Valley. Although there have been more domestic wells constructed than irrigation wells since 1970, more groundwater is extracted by irrigation wells than domestic wells.

Prior to 1970, 9,109 domestic and irrigation wells had been drilled in the northern Sacramento Valley. By 2002, the total number of wells increased to 37,046 wells. In total, this represents an increase of 27,937 wells for groundwater extraction in the past 30 years. Specifically, domestic wells increased from 6519 wells before 1970 to 31,006 wells in 2002. Irrigation wells increased from 2,590 wells prior to 1970 to 6040 wells in 2002.

Figure 2 provides the cumulative number of water wells constructed in Butte, Colusa, Glenn, Shasta, and Tehama Counties, respectively. An increase in the number of water wells and reliance upon groundwater is evident in all five counties. The increase is greater in Butte, Shasta, and Tehama Counties where larger communities exist than in Glenn and Colusa Counties where the area is predominantly rural.

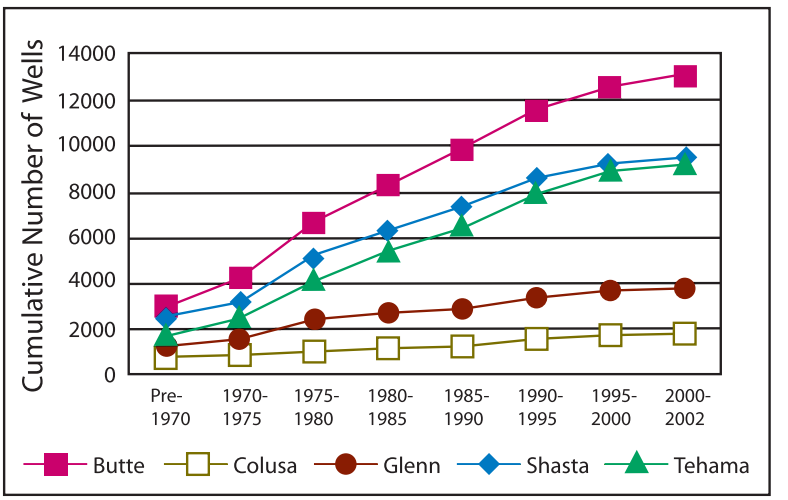

Figure 2. Total number of irrigation and domestic water wells, grouped by county in the northern Sacramento Valley.

WHY IS THERE MORE RELIANCE ON GROUNDWATER?

The explanation for the growing dependency on groundwater is complex. A combination of factors rather than any single factor is contributing to an increasing reliance upon groundwater.

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MORE DEMAND

The demand for water within the northern Sacramento Valley is on the increase and the sources of demand are diverse. The north valley population is growing and requires more water for residential and industrial uses. Environmental water needs for the anadromous fisheries and riparian habitat is increasing. This has resulted in diverting less water from streams and rivers for irrigation to provide sufficient and timely stream flows for Chinook salmon and other fish species to return to their spawning waters. As a consequence, groundwater may be substituted in response to the reduction in surface water diversion for irrigation.

Changing land uses contribute to greater reliance on groundwater. Some non-irrigated lands have been developed into irrigated forage, row and orchard crop production. Primarily due to economic considerations, orchard crops have replaced field crops across significant acreage in the north valley. Many of the orchards are irrigated using either drip or microsprinkler irrigation. These irrigation systems require water that is free of sediments and algae to avoid plugging the emitters and require water that is available on demand for low volume, frequent irrigation. In some situations, surface water may contain large quantities of algae or sediments that are prone to plugging irrigation systems and require more filtering. In some circumstances, surface water deliveries may be restricted to a set schedule where the interval between deliveries is unsuitable for low volume drip and microsprinkler irrigation, so groundwater is used.

An increasingly competitive marketplace for land and water is contributing to a greater reliance upon groundwater. Any land that has recently been developed for agriculture or will be developed in the future will most likely have to rely upon groundwater to meet the crop water requirements. This is because most local stream flow has already been appropriated and developed surface water supplies are insufficient.

A growing statewide water demand also influences the reliance upon groundwater in the northern Sacramento Valley. Water users from outside the Sacramento Valley have sought to transfer surface water supplies from the north valley to supplement their water shortages. In recent years, north valley surface water supplies have been transferred to water users outside the region and either land has been fallowed to adjust for the transfer or groundwater has been extracted to replace the transferred surface water.

RELIABILITY, INFRASTRUCTURE, AND ENVIRONMENTAL CONCERNS

The reason more wells are being constructed is not only due to more water demands. The need for reliable water supplies, costs for new surface water storage, and environmental concerns also contribute to an expanding use of groundwater.

Drought and changing water policies affect annual allocations of developed surface water supplies among urban, environmental, and agricultural water users and brings to light the issue of water supply reliability. Many water users manage fluctuating surface water supplies by extracting groundwater.

While constructing an irrigation well is expensive, commonly between $50 and $100 per foot of well depth, a well is the most immediate and tangible means for an individual or a community of water users to supplement an inadequate water supply. In contrast, constructing dams and conveyance canals to enhance surface water supplies is much more expensive, time consuming, and complex. Tough questions such as how much will it cost, who will benefit, who will pay, and what impacts will the new infrastructure have on the environment must be worked out in advance.

Future in-stream diversions are uncertain due to impacts on the environment and wildlife, especially the fisheries. Off-stream storage remains a potentially viable option for future development of surface water supplies. However, it is apparent that in order to continue to advance ideas for future off-stream surface water storage, efficient and full utilization of groundwater within reason must be pursued. Some stakeholders believe that developing the groundwater resource is less expensive and will have less impact on the environment than building new surface water storage facilities. By managing groundwater to the extent possible, it will help clarify the need and strengthen support for new surface water supplies and justify the cost.

GROUNDWATER LEVELS IN THE NORTHERN SACRAMENTO VALLEY

Groundwater levels within the northern Sacramento Valley are variable, in both location and in time. Figure 3 illustrates this point by contrasting the static (standing) groundwater levels measured annually in October since 1965 in two wells located about 20 miles apart. One area, denoted by the red line illustrates that groundwater levels remain within 10 feet of the ground surface consistently. The other area, represented by the blue line shows groundwater levels range from 30 to 100 feet below ground. The blue line also illustrates the effect of a changing hydrologic setting on groundwater levels.

This simple contrast shows that groundwater levels are dependent upon local conditions and that groundwater cannot be accurately characterized and managed as a single entity. Instead local management is necessary to account for local conditions.

IS GROUNDWATER MANAGEMENT POSSIBLE?

Groundwater is a resource that has been developed by thousands of individuals and community groups living in the northern Sacramento Valley and until now there has been little coordination among water users. So, is it realistic to believe that groundwater should be and can be managed? The question of whether groundwater should be managed is a philosophical question. Incentives for groundwater management are apparent. Sufficient groundwater must be preserved to meet future agricultural, residential, environmental, and industrial needs. The Sacramento Valley consists of fresh water aquifer systems underlain by larger saline water aquifer systems. Groundwater management must prevent mixing of the fresh and saline aquifer systems. Implementing groundwater management can also clearly demonstrate the extent that groundwater can be relied upon and the necessity for more surface water development.

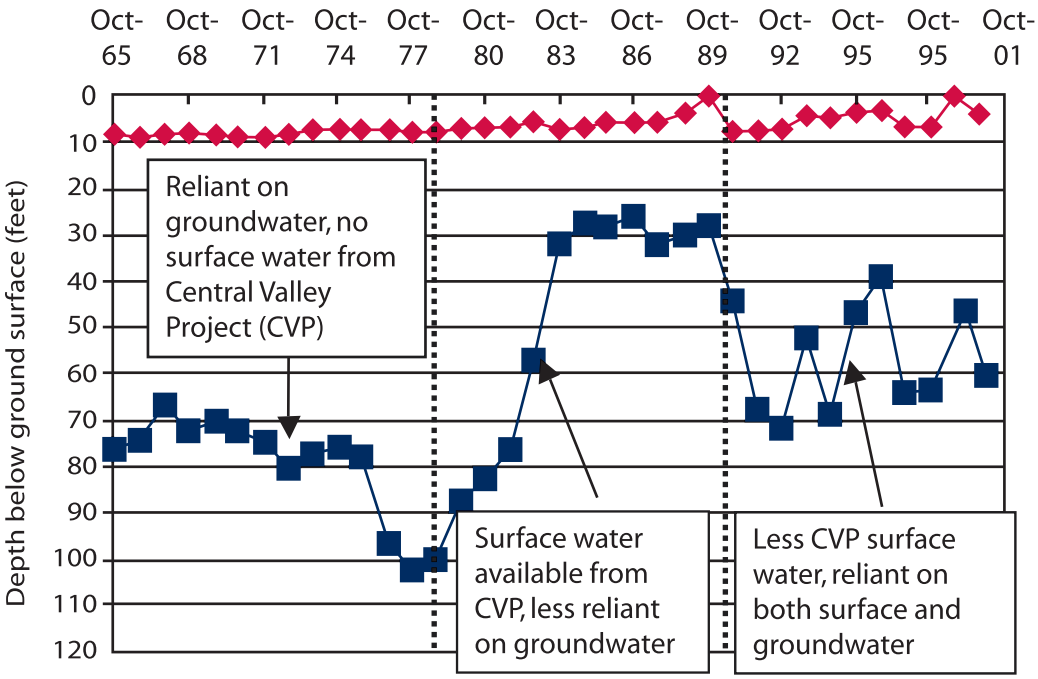
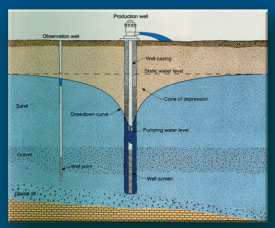


Figure 3. Comparison of groundwater levels in two areas of northern Sacramento Valley under different hydrologic settings.

Whether groundwater management can be accomplished is uncertain. Political and fiscal constraints can prevent groundwater management unless a sound approach is taken. The next issue of this informational series on groundwater, water wells, and pumping plants will discuss an approach referred to as the Basin Management Objectives (BMO) Method of Managing Groundwater. It is an approach that has been implemented in some counties of the northern Sacramento Valley. It is based upon some simple principles: 1) local control and management; 2) autonomy to define and pursue own management goals but with consideration given to surrounding areas to avoid unwanted impacts; 3) use of scientific groundwater monitoring to guide management decisions; and 4) adapting groundwater management in response to new information from the monitoring.



This newsletter is the second in a series of six discussing topics related to groundwater, water wells, and pumping plants.

Incentives for Groundwater Management in the Northern Sacramento Valley

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This Outreach is funded by the Renewable Resources Extension Act

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