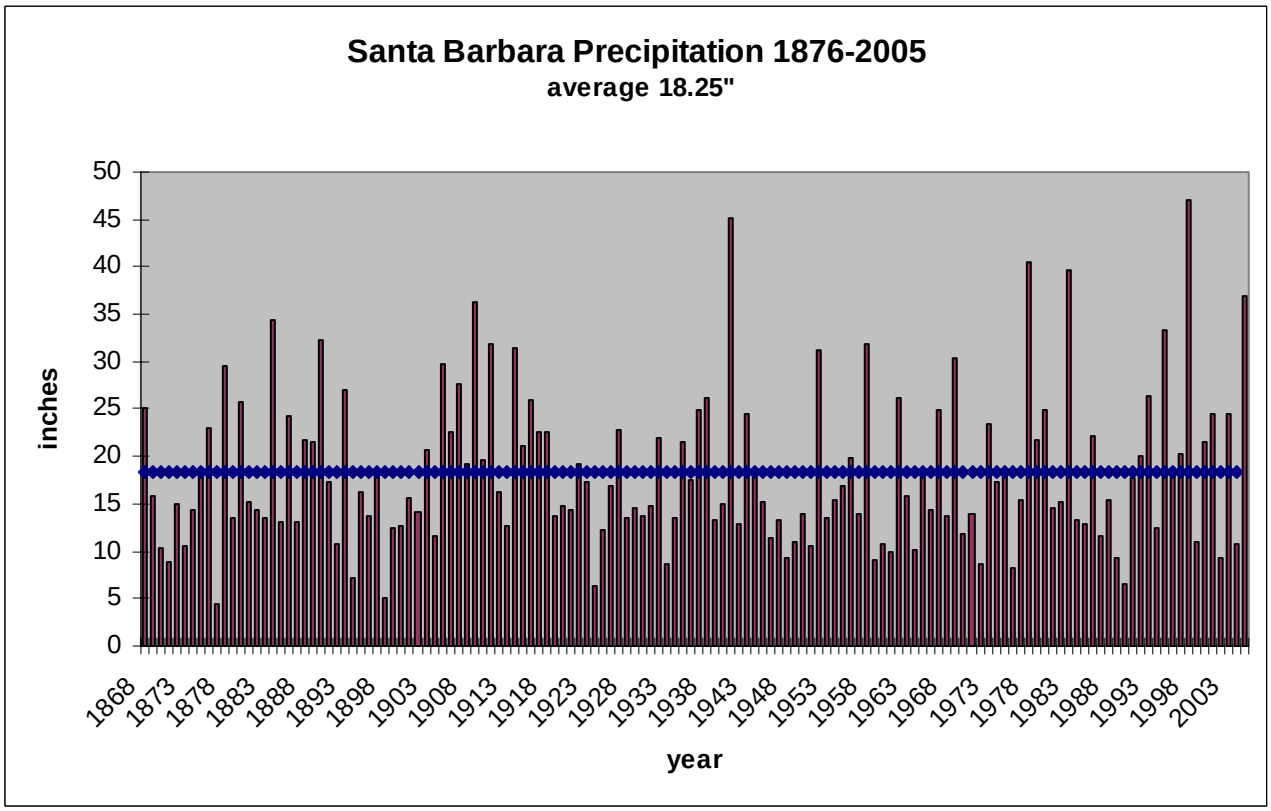
Climate and General Trends

Many of the monitoring wells discussed in this report exhibit pronounced water level fluctuations as a result of varying weather patterns of the area's semi-arid climate. These variations may be seen in the yearly rainfall chart shown below. Note that in most years the area receives below *average* rainfall.



Well response to precipitation depends on many factors including the percolation time required for recharge to reach water tables. Deep aquifers respond slowly, often having a lag time of two or more years (see hydrograph 7N/30W-29N2, Appendix A). Shallow aquifers such as those near creeks and rivers and those located in relatively shallow basins with surface material of high porosity tend to respond more quickly to variations in precipitation and stream flow. Therefore, in such areas there has been a strong correlation between well measurements for a particular year and that season's precipitation (see 7N/31W-23P1, Appendix A).

The drought of 1987 to 1991 led to significant declines in water levels (see Appendix A, well 10N/34W-14E5). Following 1991 seven out of nine years produced above average rainfall, and as a result of this wet period groundwater levels in 1999-2002 throughout Santa Barbara County were generally the highest since the mid 1940's, and in some areas highest since the 1920's. The historic winter of 1998, which produced some of the largest rainfall amounts recorded caused shallow wells to rise sharply during that year, and deeper wells to rise for up to 3-4 years afterwards. 2001 produced copious rainfall amounts throughout Santa Barbara County as Lake Cachuma filled and spilled. 1999 and 2000 were near average which does not produce significant runoff or recharge to groundwater basins. 2003 was above average but the rainfall was spread throughout the season and thus most all

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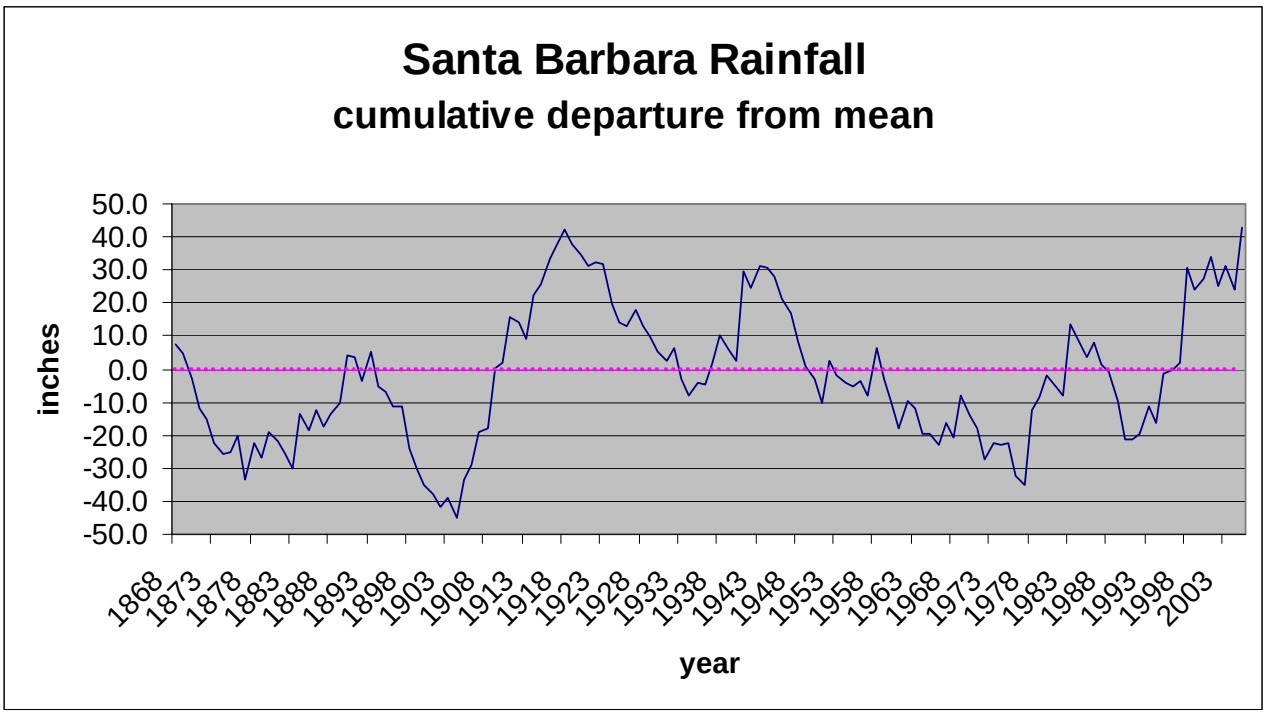
the rain was lost to evapotranspiration. 2002 and 2004 were only near 50% of average in terms of rainfall. 2005 rainfall was 188% of normal and thus was the first year since 2001 to produce substantial runoff to reservoirs and recharge to groundwater basins. Alluvial and shallow wells received an immediate response which showed up in the 2005 groundwater measurements, while the deeper wells will show the rise from this recharge over the next several years.

The graph below describes the long-term fluctuation of the local area. It is a cumulative deviation or 'departure' from mean chart which illustrates multi-year trends that the area experiences. When the graph line is rising it represents a wet trend and when it is falling it represents a dry trend. The graph shows that the area experiences long-term trends that affect groundwater levels and storage within the County. The late part of the 19th century shows a dry trend lasting through 1904, after which an extremely wet trend is exhibited, which lasted through 1918. The recent wet trend of 1991 to 2001 is one of the wettest periods on record, second only to the trend of 1905-1918. The critical long-term dry period as shown on this graph is 1946-1977, although that varies somewhat at different rainfall gauging stations throughout the County.



It is important to note that localized influences such as variations in pumping can obscure general groundwater level trends. Thus every effort is made to use well data collected during periods of no local pumping. Factors affecting trends displayed by well hydrographs include length of record, proximity to sources of recharge and active wells, and short-term climatic variations. As a result of these factors, in the Santa Barbara County region **single year or short term groundwater trends are of limited value in assessing overall basin conditions due to annual rainfall fluctuations.**

Another good way to examine the hydrologic condition of the area is to simply look at a time series chart of the storage in Lake Cachuma. When lake storage is up it generally means we are in or have just been in a wet period and when lake storage is down it generally means the opposite. Examination of the chart on the next page reveals that following the drought of 1987-1991 the Lake was high in the mid to late 1990's due to above average rainfall during the period 1992-1998. The

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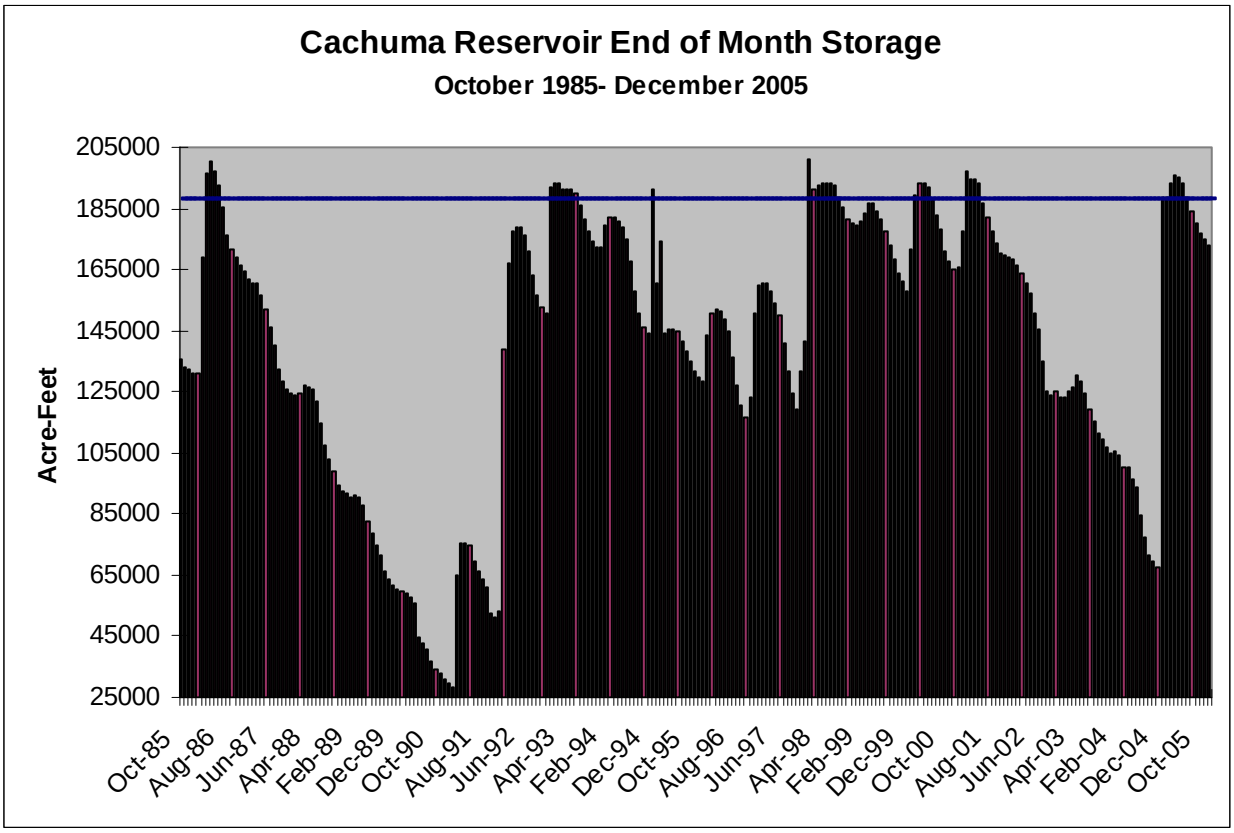
lake then dropped through the period late 2001 through 2004 due to below average or near average years but then shot back up during the extreme rain events of the 2004-2005 winter season. In 1995 the Lake was kept at a lower than normal operating level due to seismic strengthening work that was being done on the Dam. The “spikes” from 1995 were caused by exceptionally large January 10 and March 10 storms that delivered a great deal of water to the facility. The Lake was immediately and intentionally lowered right after the storms to continue with the seismic strengthening work. The “spike” in 1998 was from the February 23rd storm; the Lake was intentionally surcharged to hold back floodwaters and protect downstream interests.



A significant part of the reduction in storage during the summer of 2004 came about from water rights releases called for by the Santa Ynez River Water Conservation District. For more information on these releases please see the Groundwater Basins of the Santa Ynez River Watershed section on page 32 and the Lompoc Groundwater Basins section on page 44.

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2004-2005 Precipitation

After the extreme winter rainfall events of the 2004-2005 Season the Flood Control Division produced the Public Works Department 2004-05 Winter Report which documented the rainfall events as well as damages to the County. The following description of rainfall during the 2004-2005 Season has been taken as an excerpt from this report: The full report contains many more graphs and illustrations than in this excerpt. For the full report please go to the County of Santa Barbara website http://www.countyofsb.org/index.asp

EXECUTIVE SUMMARY

As the winter of 2005 approached, there was little indication of the unusually high rainfall amounts to come. Surface ocean temperatures of the Eastern Pacific were atypical of the strong El Nino condition that is associated with wet winters in Southern California and the first four years of the decade had produced unremarkable winters. The previous year had produced only 60% of average rainfall in Santa Barbara County and much of California had begun preparations to cope with an extended drought.

September of 2004, the first month of the 2005 water year, produced no rain in downtown Santa Barbara nor did the first half of October. However, multiple storm systems during the second half of October brought countywide year-to-date rainfall to greater than 500% of average. By the end of the month, some of the mountainous areas of the county had received over ten inches of rain. The rainfall resulted in sporadic landslides, road closures, and urban flooding. However, soil conditions remained unsaturated and there was no significant replenishment of surface water supplies.

Conditions again turned dry in November during which most locations throughout the county recorded less than 25% of normal rainfall. Through mid-December, rainfall was far below normal and storage in Cachuma Reservoir fell to only 35% of capacity. However, a late December slow moving Pacific storm system off the coast of California brought heavy rainfall, strong winds, and flash flooding to Santa Barbara County. Of particular concern was the potential for mudslides resulting from the Gaviota burn area above Highway 101.

Beginning December 27, 2004, multiple storms brought copious rainfall to all reaches of the county. These storms were characterized by the presence of subtropical moisture, which was funneled into and deposited on the east-west trending Santa Ynez Mountains. By January 12, 2005, a gage at the crest of the Santa Ynez Mountains had recorded over 48 inches of rain for the storm period alone. By that time, countywide rainfall averaged 320% of normal for the water year and watersheds were saturated. All three of the reservoirs on the Santa Ynez River were full and spilling ending immediate concerns of drought.

Widespread problems resulted from the December/January storms including road and railroad closures, mudslides, urban flooding, power outages, fallen trees, and beach erosion. Ten deaths occurred in a massive mudslide at the coastal community of La Conchita in Ventura County. In Santa Barbara County, the prolonged closure of both north and south bound Highway 101 and San Marcos Pass interrupted travel and commerce. A large debris slide forced the closure of San Marcos Road, the only access point to upper San Marcos Pass. Surrounding counties suffered significant losses of agricultural crops, but crop losses within Santa Barbara County were minimal. Despite record-

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breaking rainfall for the period, short duration rainfall amounts were not extraordinarily high and few of the major creeks and rivers overflowed their banks.

A much-needed respite during the second half of January allowed county and city departments to repair streets and culverts and to clean out debris basins, some of which had filled to capacity. Wet conditions returned in mid-February. Heavy rains returned with a February 17 storm that was held nearly stationary by a region of high pressure situated off the coast of British Columbia.

Rainfall amounts from February 17 to February 23 were as much as 15 inches over the Santa Ynez Mountains and nine inches over the South Coast. Once again, there was considerable damage to transportation, communication, and power supply but little flooding from natural watersheds. Submerged runways forced the closure of the Santa Barbara Airport and mudslides forced the closure of Amtrak's railway south of Santa Barbara County. South of Lompoc, Highway 1 collapsed at an eroded creek crossing and debris removal operations periodically closed Highway 101 at the Gaviota burn area. A mudslide severed underground cables near Camarillo causing cell phone outages to many Santa Barbara area users. Again, there was little crop loss in Santa Barbara County.

A surprisingly productive storm brought rainfall to the county March 22 and 23. Rainfall amounts of over four inches were recorded at locations in the Santa Ynez Mountains and nearly three inches of rain fell in downtown Santa Barbara. Gages along the county's South Coast recorded rainfall rates of over one inch per hour and four inches in six hours. Two deaths occurred when a car slid from the highway into Gaviota Creek.

Although unremarkable rainfall fell during the remaining months of the water year, annual rainfall totals were extraordinary. Varying with location and length of record, rainfall at most gages ranked among the ten wettest water years. Annual rainfall at some locations ranked as high as the second wettest of record and individual months as high as first.

Despite the notable rainfall totals, rainfall intensities were not outstanding. Few rainfall intensities (inches of rain per hour) throughout the county exceeded recurrence intervals of ten years. Rainfall depths for most time durations shorter than 24 hours produced similar statistical results and in no case did recurrence intervals exceed 35 years.

The year's high total, moderate intensity rainfall resulted in few instances of overtopped creeks, streams, or rivers. However, there was wide spread urban flooding, facilities damage, and interruption of transportation. Local, State, and Federal emergency declarations allowed Santa Barbara, and many other Southern California counties, to seek aid in the recovery efforts. Estimates place the total cost of damages to county-owned facilities at over 30 million dollars. Included in this estimate are the costs to repair roads, clear debris, repair county-owned buildings, and implement emergency measures.

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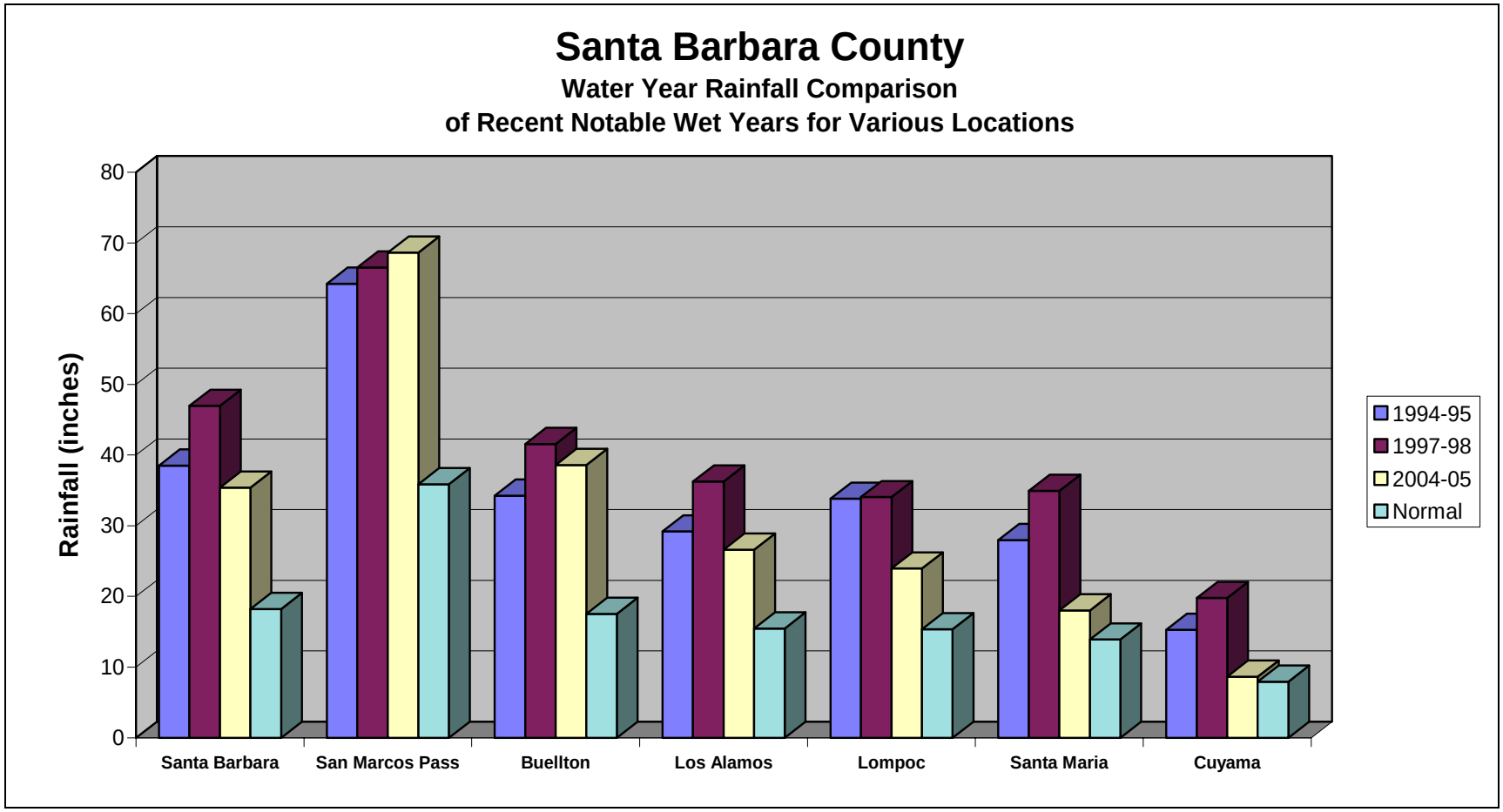

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