SANTA MARIA RIVER WATERSHED NON-POINT SOURCE POLLUTION MANAGEMENT PLAN

DRAFT PLAN

SUBJECT TO REVISION

Prepared for:

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Regional Water Quality Control Board
Central Coast Region

Prepared by:

Cachuma Resource Conservation District

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SANTA MARIA RIVER WATERSHED

NON-POINT SOURCE POLLUTION

MANAGEMENT PLAN

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EXECUTIVE SUMMARY

1. INTRODUCTION

The State Water Resources Control Board identified the Santa Maria River drainage basin as having significant water quality impairments largely due to non-point sources of pollution. As a result of this listing the Cachuma Resource Conservation district applied for a grant through the Regional Water Quality Control Board and was subsequently approved for funding under Section 205(j) of the Federal Clean Waters Act.

The purpose of the project was to identify non-point sources of pollution of both surface and ground waters, develop a mitigation plan and recommend an implementation strategy. In addition, degraded riparian habitats were identified and improvement practices were recommended.

The planning area includes the Santa Maria River, Cuyama River, Sisquoc River and all of their tributaries. In addition, the plan includes Orcutt and Oso Flaco Creeks in Santa Maria Valley. The total planning area is approximately 1,870 square miles. Approximately 58 percent of the land is in public ownership, and is managed by the USDI-Bureau of Land Management and the USDA- Forest Service. The basin includes parts of four counties. Most of the area is in Santa Barbara County (62%); however, there are significant areas in San Luis Obispo County (22%), Ventura County (15%), and a relatively small intrusion into Kern County (1%).

A Technical Advisory Committee (TAC) was formed at the start of the project, and consulted throughout the development of the plan. This committee was comprised of technical experts, and interested citizens. In addition, several public hearings were held to gather public input.

2. RESOURCE INVENTORY

Surface waters: There are five major sub-watersheds in the project area; including the Santa Maria, Sisquoc and Cuyama Rivers, Orcutt Creek, and Oso Flaco Creek.

The Santa Maria River is a relatively short stream of about 25 miles. It extends from the confluence of the Sisquoc and Cuyama Rivers near Garey to the Pacific Ocean. Much of the channel (approximately 19 miles) is contained by a levee system. Most of Santa Maria Valley east of the City of Santa Maria is diverted northerly into the River, and much of the area west of Santa Maria and north of Highway 166 is also diverted into the River. The lower six miles of River from Highway 1 to the Ocean is a relatively natural meandering course. An important characteristic of the River is that it has a tendency to migrate northerly during periods of high flows. Historically the outlet was as far north as Oso Flaco Lake, however, hydro-modifications have permanently altered the course so that it now enters the Ocean in the proximity of its current outlet. Nonetheless, the outlet location can and does change rapidly as evidenced in 1995 when the River migrated approximately one mile north of its current location.

The Sisquoc River drains all of the land between the San Rafael Mountain Range on the south and the Sierra Madre Range on the north. The opposing slopes drain into the Santa Ynez and Cuyama Rivers, respectively. Most of the watercourse is in a natural state largely because about two-thirds is within the San Rafael Wilderness area. The stream also has a Scenic River designation, and is unique for the area because it contains a healthy self-sustaining population of Rainbow trout. The hydrologic area is approximately 475.5 square miles.

The Cuyama River is by far the largest hydrologic province encompassing almost 1,074 square miles to Twitchell Reservoir, and approximately 22.5 square miles below the reservoir. The river course has been substantially modified from the reservoir upstream to the west-end of Cuyama Valley. From that point, it assumes a relatively natural meandering course to its origin in the mountains near Lockwood Valley in Ventura County. Two major tributaries, the Huasna River and Alamo Creek now merge with the River at Twitchell reservoir.

Orcutt Creek drains most of the southwest quadrant of Santa Maria Valley, an area of approximately 81.5 square miles. The stream is actually a tributary of the Santa Maria River, but it does not merge with it until it nears the ocean at elevation 12. The entire watershed is contained through an elaborate, and complex, storm-water control system. Perhaps the most significant alteration to the flow pattern is the draining of an historic lake near Betteravia. This is a depressed area within the creek that requires pumping on a frequent basis because the land is used for farming.

Oso Flaco Creek drains most of the agricultural area (11.7 square miles) in Santa Maria Valley that is within San Luis Obispo County. For the most part, it is a constructed channel. Early in this century, some of the floodwater from the Santa Maria River was routed through the creek; however, this route was permanently blocked at an unknown date. The stream is the primary water supply for the Oso Flaco Lakes system.

The only permanent natural lakes in the planning area is the Dune Lakes complex that includes three ponds with surface areas of 50, 40, and 9 acres. Bradley Lake, and a series of small ponds commonly referred to as the Betteravia Lakes, are other permanent water bodies. They are formed in part because of natural land depressions, and partly because of dams. In addition, there are numerous other constructed ponds and lakes, the largest of which is the lake formed behind Twitchell Dam. The only estuary is at the mouth of the Santa Maria River.

The Dune Lakes are sustained at maximum pool year-round by agricultural tailwater. The collective wetland habitat, including associated woodland and marsh habitat is approximately 169 acres. The area is extremely important to migratory waterfowl as well as resident species. Most of the complex is now owned by the state, and is currently managed as a wildlife area, although passive recreation such as bird watching and hiking is permitted.

Bradley Lake was originally formed in part by a natural depression. The potential surface area was enlarged many years ago by a constructed dam. The lake is sustained by natural runoff and agricultural tailwater. It is currently used as an irrigation regulating reservoir and to a lessor extent for flood control. It is located approximately one mile east of Highway 101 about half way between Santa Maria and Orcutt.

The Betteravia lakes are a series of open water ponds, marsh and interconnecting sloughs formed in part by natural depressions and constructed dams. The water bodies are located in sub-drains to Orcutt Creek between the Santa Maria Airport and Betteravia. They are sustained by winter runoff and agricultural tailwater.

Twitchell Reservoir was designed and constructed by the Bureau of Reclamation to function as a flood control and a water conservation facility. The designed storage capacity was 240,113 acre-feet with a maximum surface area of 3,690 acres. The original storage volume dedicated to water conservation was 151,045 acre-feet; however, approximately 44,000 acre-feet of have since been displaced by sediment. The remaining storage space of 89,068 acre-feet is reserved for flood control. In most years, all water captured is drained during the dry season to recharge the groundwater basin in Santa Maria Valley. In extremely wet years, there may be some carryover pool; however, this is a rare occurrence.

Throughout the area there are numerous constructed ponds varying in size from one, to over one hundred acre-feet of storage. In the general Santa Maria Valley area most of these ponds are located out of drainage ways, and used exclusively for irrigation, or frost protection when associated with wine grapes. All of these ponds are supplied from groundwater resources. On rangeland constructed ponds are used to water livestock. They are sustained by winter runoff and most go dry or nearly so between the wet seasons.

The only estuary is located at the mouth of the Santa Maria River. The area includes highly diversified wetland habitats that are used extensively by wildlife. The only other outlet to the ocean is a heavily vegetated outlet from Oso Flaco Lake. This channel ends abruptly at an open beach and assumes a meandering course through beach sand before entering the ocean.

Groundwaters: There are two major groundwater basins in the project area. One is located Santa Maria Valley, the other in Cuyama Valley. Both are used extensively for irrigated agriculture, industrial and domestic purposes. In recent years the demand on the Santa Maria basin has been somewhat offset by the importation of State water.

Land use: Land use is extremely diverse and includes a wide range of recreational activities, farms, cattle ranches, urbanized areas, mines and industrial uses. The unique climate and topography allows such diverse uses as beach recreation at the Pacific Ocean to snow sports in the interior. The marine influence allows year-round farming in Santa Maria Valley, and the foothill to mountain transition is used extensively to grow wine grapes. In some coastal areas, the microclimate is suitable to grow sub-tropical fruits such as avocados and lemons. In Cuyama Valley, there are seasonal temperature depressions so the cropping patterns are adapted to the condition, and include a variety of vegetables, deciduous fruits and nuts, and wine grapes. Most of the populated area is in the general Santa Maria area. Mining includes gravel and sand operations principally in the Sisquoc and Cuyama Rivers, and both on shore and off shore oil production. There are extensive oil field operations in both Santa Maria and Cuyama Valleys; however, the industry is in decline. Most of the land that is not dedicated to other purposes is used to graze beef cattle, including the public lands if there is suitable habitat.

The project area includes parts of four counties, Santa Barbara (745,820 acres), San Luis Obispo (263,578 acres), Ventura (174,312 acres), and Kern (12,060 acres). Approximately 93,000 acres are farmed, about 60,000 acres of which are in Santa Barbara County. The other farmland includes 31,000 acres in San Luis Obispo County, and 2,000 acres in Ventura County. Approximately 7,000 acres is dry-farmed. All others are irrigated from groundwater sources. Similarly, most of the urban and mined area is also in Santa Barbara County with approximately 34,400 acres devoted to those purposes. Of the 1,195,770 acres in the watershed, over 58 percent (697,000 acres) are public lands managed by the U.S. Forest Service or the Bureau of Land Management.

Topography: Elevations range from sea level to 8,286 feet at Mt. Abel the highest point in the Cuyama River watershed. The land characteristics include two major valleys, Santa Maria and Cuyama both of which are relatively flat. Santa Maria valley is bordered by rolling foothills that transition abruptly into steep mountains. Cuyama Valley is bordered by the Caliente Mountains to the north and the Sierra Madre Range to the south. The transition to the rugged Calientes is abrupt; whereas, there is a gentle foothill transition to the Sierra Madre Range. Both ranges are joined by transverse ridges at the eastern and western ends of the valley.

Climate: Precipitation varies considerably throughout the area, ranging from an average annual rainfall of six inches in Cuyama Valley to approximately 40 inches in the high elevations; however, extreme variances are common. In general precipitation increases rapidly with increasing elevation with the exception of Cuyama Valley. Although Cuyama Valley elevations range from about 1,400 feet on the western end to 3,500 feet on the eastern end, most of the precipitation is captured in the surrounding mountains. Precipitation in the form of snow is common in the mountains, but only on rare occasions in Cuyama Valley.

Temperatures are relatively mild in the coastal areas because of the moderating influence of the ocean, and ground fog is common particularly during the summer months. Although the coastal area is not frost free, temperatures below freezing are usually for relatively short periods. Conversely, the Cuyama region experiences significant seasonal temperature variations with summer temperatures frequently exceeding 100^{o} F and winter inversions to 10^{o}F. Freezing temperatures are common in all of the mountainous areas.

Stream flows: Two stream gages are maintained in the watershed, the Buckhorn gage on the Cuyama River and the Garey Station on the Sisquoc River. The Buckhorn gage is located approximately one-half mile west of the Tepesquet Road Highway 166 junction. The Garey gage is located at the Tepesquet Road bridge. The Buckhorn gage has been maintained since 1960. During the period flows peak flows ranged from one cfs in 1964 to a high of 26,200 cfs on 02/23/98. The Garey station has been maintained since 1941. No flows were recorded in 1948, 1951, 1961, 1964, 1985, 1987, 1989, and 1990. The high peak flow was 33,600 cfs on 03/01/83. In 1998 the highest flow recorded was 29,500 cfs on 02/03.

Geology and soils: Due to the size of the watershed and variety of geologic and soil conditions, no attempt was made to describe them in this publication. Geologic maps can be obtained from the U.S. Geological Survey or the Dibblee Geological Foundation. Soils information is available through the Natural Resources conservation Service.

Natural habitat types: Because of the complex distribution of soils, topography and precipitation, there are a great variety of habitats. In many areas, there are abrupt changes in plant communities; for example, north-facing slopes may be dominated by oak woodlands whereas south-facing slope may be chaparral.

The habitats range from coastal strand to montane coniferous forests in the interior uplands. Most of the habitats are dominated by native plants except the grasslands that are dominated by annual grasses introduced from the Mediterranean area. Some of the stabilized coastal dunes have dominant colonies of introduced African veldt grass.

Sensitive species and habitats: according to the California Department of Fish and Game (F&G) "Natural Diversity Data Base" dated 12/01/99 there are 32 animal or plant species that have a formal designation of sensitivity. Twenty-three other species have been identified by the F&G or the U.S. Fish and Wildlife Service as species of special concern. The database also lists a variety of habitats as sensitive, but there are no designations assigned to define the degree of sensitivity. The sensitive species list includes 24 plants, 7 mammals, 12 birds, 5 amphibians, 5 reptiles, 2 fish, and 1 invertebrate.

Cultural development and historical water use: The first settlers following the indigenous Indian tribes were the Spanish in about 1840. They occupied numerous land grants and primarily raised beef cattle. Most suffered severe financial losses because of a severe drought in the 1860's, and sold much of the land to American pioneers who arrived in the area about 1865. At that time dry land farming of grain was introduced to Santa Maria Valley and various fruits and beans shortly thereafter. Union Sugar Company introduced irrigated farming to the area in 1897 to raise sugar beets. The original water conveyance system was a gravity flow diversion from the Sisquoc River, however, the system was destroyed by floodwaters several years later. By the 1920's the cropping pattern shifted from grain and beans to irrigated vegetables-a pattern that exists to the current era. All of the crops were, and still are, irrigated from pumped groundwater supplies. At the same time the vegetable industry was growing numerous small dairies were also developed. Through the years, many went out of business or consolidated – a trend that continued until the 1970's when most responded to a government buyout program. Today only two dairies remain one In Santa Maria Valley and one in Cuyama Valley. In the last two decades there has been a substantial growth in irrigated agricultural in both the Santa Maria and Cuyama Valleys. Paralleling the growth in irrigated agriculture has been a significant build out in the urban areas, which also increased the water demand.

Extensive water use in the Cuyama Valley did not occur until the start of World War II when electricity was introduced to the area. Prior to that time, most of the land was used to raise beef cattle, with only about 400 irrigated acres farmed. By the end of the war, the irrigated acreage was about 5,000 acres. Irrigated cropland increased rapidly to approximately 20,000 acres and remained stable until the mid-1980's. Since then, the irrigated land has increased to approximately 28,000 acres. Historically the primary crop was alfalfa which accounted for about 75 percent of the farmed area in most years. In the current era less than 15 percent of the area is used to grow alfalfa. In the mid-1980's carrots and a variety of deciduous fruits and nuts were introduced. More recently, there has been significant plantings of wine grapes.

3. WATER QUALITY OBJECTIVES

Non-point source regulatory authorities: The Central Coast Regional Water Quality Control Board is responsible for administering regulations established by the Federal Clean Waters Act (CWA) and the California Water Code. Polluted runoff is also addressed under Section 6217(a) of the Coastal Zone Act Reauthorization amendments of 1990. Oversight of the regional board is provided by the State Water Resources Control Board.

The CWA is the principal authority for water quality protection. It became law in 1972. At that time, it principally addressed point sources of water pollution. In 1987, Congress amended the act to require states to address non-point sources of pollution. The amendment requires states to adopt water quality standards, and to submit the standards to the U.S. environmental Protection Agency for approval. The act also requires that states implement appropriate measures to address non-point water quality concerns by 2013. In California, the preferred method of implementation is a three-tiered approach. Tier 1 would be a voluntary application of improvement measures. Tier 2 is partially based on regulatory authority in that it allows the Regional Boards to encourage implementation of improvement measures by waiving waste discharge requirements on condition that improvements are implemented, or to use direct enforcement by entering into agreements with other agencies that have regulatory authority. Tier 3 is enforcement of requirements to reduce pollution.

Beneficial uses: State policy for water quality is directed toward achieving the highest water quality to provide maximum benefit to the people. To accomplish this, 24 categories of water use were developed and applicable uses were assigned to all surface waters. (Five of the categories do not apply to this project.)

Water quality general objectives: General objective have been established for all State waters that enact goals for ocean waters, inland surface waters, enclosed bays and estuaries, agricultural supplies, recreation, various fishery habitats, and for municipal and industrial supplies.

Water quality specific objectives: In addition to the general State water quality objectives the Regional Board has established specific objectives for selected waters in the project area. The selected waters include the Cuyama and Sisquoc Rivers and the ground water basins in Santa Maria and Cuyama Valleys. The goals include desired limits for total dissolved solids, chloride, sulfate, boron and sodium in the rivers, and ground waters. The ground waters also include desired median levels for nitrogen content.

4. WATER QUALITY ISSUES

Overview: The Regional board and the U.S. EPA has identified non-point sources of pollution as the leading cause of water quality degradation throughout the U.S., including the Central California Coastal region. Non-point sources of pollution may be the result of human activities, natural leaching from the soil and rocks, and/or precipitates from the atmosphere. Individually, these sources may be insignificant, but they build upon each other during runoff or leaching to the ground waters. The watershed has a great diversity of uses that include large tracts of native landscape as well as land that is intensely used by agriculture or is highly urbanized. All areas contribute to the pollution, including the native lands.

Non-point pollution is generally defined under four categories; Erosion/sedimentation, Pesticides, Nutrient Contamination, and Microbiological Contamination.

Erosion and transport of sediment is a natural function of hydrologic systems, but excessive sedimentation can effect the utility and economy of the land, impact wetlands and wildlife habitats, affect the hydraulic function of waterways, and absorb and transport toxic chemicals, nutrients and metals.

Pesticide chemical formulation and usage has changed significantly in recent years. Persistent old-generation chemicals such as DDT, chlorodane, and toxaphene have been banned and replaced by compounds that decay rapidly and are more target specific that the older broad spectrum chemicals. Agricultural chemical use is closely regulated in California with all uses requiring a report to the County Agricultural Commissioners. Conversely, many of the same pesticides available to agriculture are also available for non-agricultural purposes. However, they are not subject to the same regulations.

Elevated nutrient levels, particularly nitrogen compounds, are a concern. Concentrations in ground water can affect human health, and concentrations in surface waters can accelerate vascular plant growth or lead to excessive algal blooms that lead to oxygen depletions.

There are no reports that suggest that biological contamination of public water supplies is a concern in this project area. However, it would be prudent to test private water wells that are used for human consumption. Most rural water wells are relatively shallow so there is less filtering when the ground water is recharged. The most common cause of microbiological contamination is from coliform bacteria and parasitical infections from *Cryptosporidium parvum* and *Giardia duodenalis*. Most of the surface waters allow free access to both wild and domesticated animals that are vectors for delivering the contaminants so the potential for contamination exists.

Ground water Santa Maria Valley: Numerous studies of the ground water basin have been completed. Many of the reports concentrate on water quantity and safe yield of the aquifer, but in all cases there are conclusions expressed that relate to water quality. The most comprehensive report related to water quality was prepared by the U.S. Geological Survey (Hughes, 1977). The following conclusions were made based on an analysis of the reports:

(1) Recharge of the basin is extremely important in improving the salt balance. Several reports use models to assess the state of the basin relative to safe yield. The assessments of the basin condition vary considerably, ranging from no overdraft (Lundorff & Scalmanini, 1997) to an estimated annual average overdraft of 8,000 acre-feet by the Santa Barbara County Water Agency, 1999 (WA). Older reports estimated the overdraft ranging from 6,000 acre-feet (Toups) to 20,000 acre-feet (WA).

The latest WA report (1999) reduced the overdraft estimates based on credits for State water importation. This report uses models that include examinations of the historic groundwater elevations as well as estimates of water consumption by the various users. The Lundorff & Scalmanini (L&C) report only uses the historic groundwater elevations in their assessment.

It may be prudent to re-examine the basin. The L&C analysis is based on after the fact impacts; i.e., an examination of historic groundwater elevations. Several factors could affect the future condition of the basin that could have a significant impact on safe yield, but not become apparent for an extended period. For example, Twitchell Reservoir was estimated to increase recharge to the basin by an average of approximately 20,000 acre-feet per year through controlled releases from water stored in the conservation pool. The capacity of the storage pool has since been severely compromised by sediment accumulation. This accumulation has currently displaced about 26 percent of the conservation pool capacity so the recharge capability is certainly diminished, and it is decreasing at an average rate of about 1,200 acre-feet per year. Secondly, the L&C report suggest that the recharge some of the basin stability might be attributed to the “leveling off” of agricultural demand. The fact of the matter is that irrigated agriculture has increased substantially, particularly within the last decade.

The WA reports estimate safe yield based in part on historic groundwater elevations, estimates of agricultural usage, and metered M & I usage. Some of the duty factors used in estimating agricultural water use may not be valid, and there have been changes in cropping patterns and acres irrigated. The reports are largely base on duty factors for “Applied Water” that were developed in 1994. Apparently, this is a crop evapotranspiration (ET_c) value – not the gross pumping requirement as implied. Some of the ET_c duty factors should also be reviewed. For example, the duty value assigned to annual row crops (truck crops), the most common commodity apparently is based on producing two crops per year per acre. In reality, most farmers produce at least 2 ½ crops per year. Other duty factors, such as those used for grapes should be reviewed. The applied factor for grapes in the report is 2.0 acre-feet. It should be about 1.3 acre-feet.

None of the reports accounts for losses of water out of the groundwater basin when calculating safe yield. Because of system inefficiencies, and perched water tables in the western end of the valley, some water is discharged to the ocean or Oso Flaco Lake. (The perched areas are all drained with sub-surface tiles.) Another concern not addressed is an increasing water loss through evaporation. Even if there is no further growth in agriculture, the pumping demand will increase because of increasing salinity. Larger leaching fractions will be required to produce the same crop yields, and evaporation will increase because of the additional water exposed to the atmosphere.

(2) Well sampling has been sporadic and somewhat random. Multiple agencies collected samples, but there does not appear to be any coordination between the agencies. There is a need for a centralized database, a prescriptive grid and sampling protocol, and scheduling procedures to provide the consistency to make accurate assessments of the groundwater condition.

(3) Nitrate levels in some areas of the basin exceed, or are very near the public health limit of 45 mg/l, and the apparent trend is that they are increasing. The most acute regions are in the vicinity of Guadalupe, Santa Maria, and Sisquoc which coincidentally are also areas of groundwater depression. This is the apparent product of agricultural fertilizer leaching.

(4) Salinity is increasing throughout the basin primarily due to agricultural activities in part from leaching applied chemicals that are not consumed by the plants, and partly from return irrigation flows with salt concentrations as the result of evaporation. (Basin recharge from the Santa Maria River is also moderately saline. Water samples taken by the RCD indicated a relatively constant electrical conductivity reading of 1.2 mmhos/cm during summer releases from Twitchell Dam.)

(5) Elevated boron, sodium and chloride levels near effluent discharge areas are likely from urban sources. Elevated levels of any of these elements could affect crop productivity; however, the concern may be mitigated with the importation of State water. This improved water quality will preclude the need for water softeners which should reduce the sodium and chloride levels.

(6) A large part of the recharge comes from the Cuyama River. This watershed has an inherently high concentration of dissolved solids. A large part of the concentration is calcium sulfate (gypsum) which is a likely reason that the soil alkalinity is not elevating.

Ground water Cuyama Valley: Unlike the Santa Maria Valley basin, the Cuyama Valley ground water basin has had limited study, perhaps because there is only a small demand for domestic and industrial purposes. Historically, and under present conditions, the agricultural demand accounts for almost 98 percent of the water use. The following conclusions were based on the reports available:

(1) Farming in Cuyama Valley has undergone a rapid transition and substantial growth in the last decade converting from a largely alfalfa hay region to a diversification that includes various vegetables and perennial fruits and nuts in addition to alfalfa. However, accurate assessments of the groundwater basin sustainable yield are lacking and largely based on old information that may no longer be valid. Estimates of water consumption are obviously grossly in error. The most recent estimate (1999) of consumptive use published by the WA was 28,000 acre-feet. Land use surveys completed as part of this project indicate that there were approximately 28,000 irrigated acres currently using the aquifer as a water source so the evapotranspiration requirement is at least triple the 1999 estimate. The 1951 USGS groundwater study suggests that the perennial yield is between 9,000 and 13,000 acre-feet. Even if this study is off by 100 percent, it appears that there is a severe annual overdraft. A groundwater study of this area is highly recommended.

(2) High concentrations of nitrate have been observed in some locations since the early development of irrigated agriculture. The sources of contamination are difficult to determine. Until the introduction of electricity in the late 1950s, there were less than 5,000 irrigated acres. In the early years, most of the crops produced required some nitrogen fertilizer applications; however, during the period of rapid growth following the introduction of electricity and until the late 1980s the preferred crop was alfalfa. At any period, alfalfa accounted for approximately 75 percent of the irrigated crops. The other acres were either fallow, or in some cases used to produce an annual rotation crop. Alfalfa crops were rotated in three to five year cycles, and since the crop had nitrogen fixing capability no nitrogen fertilizers were applied. In addition, it is likely that there was enough residual nitrogen available in the soil from decomposition of alfalfa so that little if any additional nitrogen would have been required to produce the rotation crops. Since there always has been a record of excessive nitrate in the groundwater throughout the cropping history, it is likely that at least part of the source is from natural causes.

(3) Well monitoring for water quality has been sporadic and limited to just a few locations since the original study in 1951, and there are no continuous records at any of the monitoring locations. Water quality ranges from very poor in the areas adjacent to the Caliente Mountains to relatively high quality on the eastern end. Most of the irrigation water in the central part of the valley is of fair quality with TDS ranging from 1,500 to 1,800 mg/l. On the eastern end of the aquifer, TDS ranges from 400-700 mg/l. The water is very hard and predominantly calcium-magnesium sulfate type. Presumably, the high leaching fractions required are accelerating the salt load; however, there are no reliable records to support this conclusion.

Surface waters-rivers and streams: There is limited historical documentation of stream water quality except for the1977 USGS report, and that report had limited information. All of the samples were taken in the 1960's. The report included samples taken from the Cuyama River below Twitchell Reservoir, Sisquoc River at three locations, Huasna River, Alamo Creek, Tepesquet Creek, Nipomo Creek, and Foxen Creek. Except for the Cuyama River, only one or two samples were taken at each location. The author apparently took samples from various irrigation tailwater ditches at random locations because he suggests that there are significant solute concentrations associated with agricultural irrigation practices. He based this conclusion on electrical conductivity measurements that ranged between 2.0 and 3.0 mmhos/cm. During the development of this project, water samples from Orcutt Creek at the West Main Street crossing and Oso Flaco Creek at Oso Flaco Road were analyzed from May 1999 through January 2000. During the sample period, all flows were from irrigation tailwater. Electrical conductivity at Oso Flaco Creek ranged from 1.6 to 2.6 mmhos/cm and nitrate from 110 to 280 ppm. Orcutt Creek electrical conductivity ranged from 2.2 to 3.0 mmhos/cm and nitrate measurements were 130 to 180 ppm.

The reports concluded that the surface waters contribute an average solute load of 57,000 tons per year, most of which (48,000 tons) comes from the Cuyama River. It also established that there is an inverse relationship between flow rates and solute concentrations. At low flows (<15.0 cfs) the Total Dissolve Solids (TDS) in the Cuyama River ranged fro1230-1590 mg/l. Other measurements taken were at flows ranging from 82-288 cfs. At these higher flows, TDS measurements ranged from 530 to 875 mg/l. Salinity, measured as electrical conductivity, showed similar relationships with the low flows ranging from 1.22 to 2.06 mmhos/cm and the high flows 0.74-0.83 mmhos/cm.

Urban land use and practices are presumed to significantly add to the non-point pollution load. Although there are no definitive studies to support this conclusion that have been completed locally, a recent national study (Horner, etal 1994) concludes that the hydro modifications associated with urban land have a significant impact on non-point pollution loading.

Soil erosion associated with upland farming and incised drainage ditches in the relatively level areas, are significant contributors to excessive sediment loads. Many of the upland parcels that are currently farmed have been converted from range land. Most are rented for relatively short terms so there is little incentive for growers to install soil conservation practices if they involve relatively expensive devices. In the areas that are precision leveled, most of the drain ditches are deeply incised with side slopes of less than 1:1. With this type of construction, there are frequent bank failures during the periods of high runoff.

Surface waters-lakes and ponds: The lake formed behind Twitchell Dam in most years is the largest surface water body in the project area during winter and spring. However, storage is relatively short term since it is drained throughout the summer months to recharge the Santa Maria Valley ground water basin. Since construction in the late 1950's, sediment has been accumulating at an average annual rate of 1,200 acre-feet per year. Most of this accumulation is in the water conservation pool resulting in a storage loss of approximately 44,000 acre-feet, which is about 26 percent of the conservation pool capacity. The sediment accumulation is a serious concern because loss of storage not only affects the groundwater recharge capability, but it is also is posing a threat to the operation of the outlet works that control discharges. Most of the sediment is from geologic sources in the Cuyama River watershed; however, several events have accelerated the sediment input. Major wildfires have caused a short-term acceleration of erosion, and the relocation of Highway 166 between the dam and Cuyama valley undoubtedly also increased erosion. Two wildfires encompassing an area of approximately 64,000 acres have occurred within the past five years. The U.S. Forest Service estimates that about 27,000 acres within those burn areas had a moderate to high erosion hazard during the recovery period which was estimated to be 5 to 10 years. During the Highway 166 relocation, approximately 7,300 feet of meanders were removed from the Cuyama River which increased down cutting of the channel. As part of a separate study, the sediment was analyzed for heavy metals, petroleum hydrocarbons, volatile and semi-volatile organic material, and pesticides. None of the tests revealed any element or compound that exceeded regulatory thresholds.

There are few locations where erosion can be controlled within economic reason in the Cuyama River watershed. Most of the erosion is on steep public lands. Even if projects were technically feasible, environmental mitigation requirements would likely make most projects cost prohibitive. In addition to erosion of the steep uplands, almost all of the outside meanders of the Cuyama River are highly eroded with escarpments that are 20 or more feet in height.

The Dune Lakes complex is the largest year-round surface water body. The lake levels are largely maintained by agricultural runoff from gravity flow irrigation systems. There are numerous published studies of the area, but most only discuss water quality in anecdotal form such as reference to dense algae colonies probably being the result of agricultural nutrients in the incoming agricultural tailwater. Water sample taken during the study indicated that those assumptions were correct. Monthly samples were taken to measure salinity, pH, nitrate, and hardness from May 1999 through January 2000. All samples indicated elevated nitrate content and moderate salinity levels. The nitrate levels entering the Lakes ranged from 110 to 280 ppm. Salinity measured as electrical conductivity measured 1.6 to 2.6 mmhos/cm. Water samples taken at the causeway between the upper and lower lakes indicated that on average approximately one-third of the nitrate was taken up by plants in the upper lake.

No water quality samples were available for any of the other ponds in the project area. It is likely that Bradley Lake and the Betteravia ponds have somewhat elevated nitrate content because they are supported by agricultural tailwater during the dry seasons. Numerous ponds that have been developed primarily as livestock water sources. All are charged by winter runoff, and most go dry, or nearly so, by the end of the dry season. Those that do retain some water are usually sustained by springs and seeps. There are no recorded incidences of contamination to public water supplies related to livestock production or wildlife. However, it is likely that there are elevated levels of *coliform* bacteria and perhaps *Cryptosporidium parvum* oocysts during periods of limited water supplies since most ponds allow free animal access. The Huasna River, Alamo Creek, and the Cuyama River all have healthy beaver populations, and *Giardia duodenalis* oocysts are likely present in these watersheds since beavers are primary carriers. Although there is no documentation to suggest that public water supplies are contaminated, it would be prudent to test all private water wells and no surface water should be used for human consumption without treatment.

There is limited information concerning water quality in the Santa Maria River estuary. However, the Regional Water quality Control Board is in the process of implementing a water quality monitoring program. The CA Department of Fish and Game (F & G) is also preparing a bio-assessment and sediment chemistry analysis. In 1998 the F & G took a single sample and determined that there were elevated levels of DDT, dieldrin, and nickel. Surface water contamination in the estuary may also result from hydrocarbons related to oil industry actions in the nearby dunes. However, a mitigation plan for this concern has been prepared and is in the implementation stage.

Conclusions:

It is apparent that the most critical pollution concerns in this project area are the groundwater basins. Most of the pollutants are associated with non-point sources, the bulk of which are products of agricultural activities. However, urban and industrial activities and natural sources also contribute to the problem. Both basins have immediate concerns with nitrate contamination, and increasing salt loads are resulting in increased salinity. In the absence of a comprehensive management plan, the increasing salinity will require growers to increase leaching fractions to maintain productivity, or change crops selections to species with greater salt tolerance. By increasing leaching fractions, water quality degradation will accelerate due to the greater pumping requirements and increased opportunity for evaporation resulting in increased surface salts.

Water quality information for lakes and ponds in the project area is limited. However, based on the assessment of the Oso Flaco Lakes it is likely that Bradley Lake and the Betteravia Lakes probably have elevated nitrate and TDS levels because the incoming waters are largely draining from intensively farmed areas. Stock water ponds and some streams may have excessive contaminants, particularly pathogens from animal fecal matter. The severity of contamination would likely be increased as the summer season progresses as the water volume decreases because most of these water sources become dry, or nearly so each year.

It appears from the measurements taken from selected sub-watersheds within Santa Maria Valley that most of the drainage ways within the valley would have elevated levels of contamination because of the intensive land uses. Conversely, there does not appear to be any significant pollutant sources in rural area streams. However, there is little information concerning rural water quality so there may be some streams that are above the established standards for specific beneficial uses.

5. WATER QUALITY MANAGEMENT STRATEGIES

Overview: In order to assess the many contributing sources of non-point pollution and develop management strategies the planning area was divided into nine land use categories, five of which pertain to agriculture. The agricultural categories include irrigated annual upland crops, irrigated leveled annual crops, irrigated perennial crops, range land, and dry-farmed annual crops. Other categories include mined land, public land (federal), urban land and rural residential. Urban land includes commercial and industrial uses. Mined land includes oil fields that have secondary uses such as livestock grazing. These land uses are similar to, but not consistent with, criteria used by the CA Department of Conservation mapping programs.

Land use definitions and trends:

- <u>Agriculture, Upland irrigated annual crops</u> – Include commodities that are produced in less than one year from planting to harvest on land with topographic features that precludes the use of gravity flow irrigation systems. This form of land use is increasing substantially both the coastal area and in Cuyama Valley. In most cases, the principal previous land use was livestock grazing.
- <u>Agriculture, Leveled irrigated annual crops</u> – Include commodities that are produced in less than one year from planting to harvest on land that is precision leveled to allow the use of gravity flow irrigation systems. All of the land that is level, or nearly so, has been appropriated for some purpose so there is no opportunity for growth.
- <u>Agriculture, Irrigated perennial crops</u> – Include a variety of commodities, the most common of which is wine grapes, although deciduous fruits and nuts are predominant in the Cuyama Valley. In recent years there has been substantial growth in the wine grape industry and it appears that this growth will continue. Most of the sites that are being used are converted foothill areas that were formerly used to graze cattle. In the previous decade there was

considerable growth in deciduous fruits in Cuyama valley, but that growth has slowed considerably.

- Agriculture, Rangeland – Includes all areas that produce forage for livestock without any cultural practices being employed. There has been a steady decline in livestock production for the past 20 years and it appears that this trend will continue as land is converted to other uses. In most cases, the land use conversion takes the most productive range sites.
- Agriculture, Dry farmed crops – Includes crops that are raised without the benefit of continual irrigation. In some cases, minor amounts of supplemental water may by applied. This land use has been declining in recent years and it is expected to continue this decline as land is converted to other uses.
- Mined land – Most of the mining sites in this project area involve oil and natural gas, or gravel mining in certain parts of the Cuyama and Sisquoc Rivers. Oil mining is declining rapidly throughout the area; whereas, sand and gravel mining appears to be stable.
- Public Land – In this project area, public land includes all areas that are under federal management by either the Bureau of Land Management (BLM) or the Forest Service. Other public land, such as city and county ownership were included as urban land. The amount of public land is likely to remain relatively unchanged. There are numerous segregated BLM parcels where public access is precluded. BLM planning documents propose that they be sold or traded; however, those actions are slow to be implemented.
- Urban land – Includes all residential, commercial and industrial properties. Urban landscape such as golf courses, cemeteries, urban open space, and similar uses are also included. Substantial growth is predicted for the coastal areas.
- Rural residential – Includes all properties that are zoned RR-5 through RR-100 in county ordinances. The trend is unknown.

General planning considerations: Four significant issues should be considered when there is a change in land use or a significant change in operations. The issues of concern include soils, topography, water quality, and sensitive species and habitats.

Soils are probably the most limiting factor, particularly with agricultural activities. In this area, the valleys have deep alluvial soils with relatively good soil chemistry and have little limitation unless they have been reshaped without stockpiling and redistributing topsoil. However, some regions have inherently poor soil chemistry because of alkalinity and/or salinity concerns. Soil pH can range up to 9.0 and electrical conductivity sometimes exceeds 4.0 mmhos/cm. However, most of the soils are near neutral ranging from slightly acidic to slightly alkaline.

Topography is an obvious consideration for any intensive land use because of costs increases associated with erosion control, placement of infra-structure, and design of irrigation system. Soil depth to bed rock usually decreases as slope increases which may limit agricultural land use.

Water quality is a primary concern if irrigation is part of the land use, particularly on steep uplands. Steep lands dictate that drip and micro-irrigation systems be used to assure efficiency in applying water and to prevent irrigation induced soil erosion. Poor water quality increases filtration and system management costs and reduces crop productivity.

There are many sensitive species and habitats throughout the project area, and they are found in all ecological zones. Wetlands of all types are considered sensitive, and even modest activities in these areas can trigger punitive actions by regulatory agencies. When there are major land use conversions to be made, it is wise to consult with a qualified biologist before any action is taken if there is any question concerning species or habitats. Mitigation requirements for disturbing sensitive habitats can be a formidable and expensive task.

Essential practices: The most critical non-point source pollution problems in this area are increasing salt loads and nutrient contamination of the aquifers. To mitigate these concerns, certain practices must be applied. They include irrigation system designs, irrigation system maintenance, irrigation scheduling, nitrogen management, and urban turf water management.

All irrigation systems should be planned by a competent irrigation system designer. This is a particular concern if there is undulating topography or where there is a system type conversion. No system is 100 percent efficient; however, properly designed systems should attain certain minimum efficiencies. Efficiency is largely determined by the distribution uniformity (D.U.) of the applied water. The minimum industry standards for D.U. are 75% for sprinkler and furrow systems, and 85% for drip and micro-sprayers.

Maintenance of irrigation systems is probably more responsible for poorly functioning irrigation systems than poor system designs. In approximately 600 irrigation system evaluations completed by the RCD approximately 70% were operating below industry minimum standards. These tests included both agricultural and large urban turf evaluations. The urban turf systems had the poorest D.U.'s with over 90% below industry standards. Most sub-standard conditions were relatively easy and inexpensive to correct. Problems typically identified with sprinkler systems were worn nozzles, variable nozzle sizes, uneven spacing between laterals, and runs exceeding the system capabilities. With drip and micro-sprayers typical problems encountered were uneven pressures, plugged emitters, inadequate system flushing, and inadequate water treatment.

Irrigation scheduling is the duration and frequency of irrigation required to for plant needs. Excessive irrigation results in accelerated salt transport and pollution of surface and ground water. Factors that must be considered are the type and growth stage of the plants, application rates of the irrigation system, water holding capacity of the soil, evapotranspiration rates, and other issues such as leaching fractions and other cultural needs that must be satisfied. Many tools are available to assist irrigators. One important aid is the California Irrigation Management Information System (CIMIS). CIMIS is a network of weather stations that convert environmental data to daily reference evapotranspiration (ET_o). ET_o is based on evaporation and transpiration requirements for turf grass. From this reference, coefficients are used for various crops to determine water requirement required to replace consumed soil water. Many of the coefficients are published. The coefficient can also be estimated with reasonable accuracy with some experience.

The most important factor in reducing nitrogen losses is to apply the specific amount required by a crop and to effectively manage the irrigation system. In simple terms, a nitrate management plan has three basic elements; the development of general fertilizer guidelines, an evaluation of field factors, and a monitoring plan. The general plan should acknowledge that there are different fertilizer requirements at different times of the year. Similarly, plant requirements vary depending on the growth stage with most of the fertilizer requirement when the plants near maturity. Fields and water sources should be checked for residual nitrate, and monitored throughout the growing season. Water source nitrate is relative constant; however, field nitrate can change rapidly. Research has proven that up to 1.5 pounds of nitrogen per acre is produced daily during the warm seasons due to the mineralization of previous crops. There are various meters available to measure nitrate content, and all have a relatively high degree of accuracy.

Urban turf irrigation systems include both solid set and hose end sprinklers. Numerous test of these systems indicate that most operate at less than 50 percent D.U. The most common problems associated with solid set systems are broken or plugged sprinklers, poor placement, mismatched parts, and crooked or sunken heads. Hose end sprinkler inefficiencies are usually associated with leaks and poor placement resulting in watering of impervious surfaces. All of these conditions can usually be observed and are easy to correct. Over watering is also a concern. Most of the urban area has relatively light soil textures with low water holding capacities, particularly south of Betteravia Road in Santa Maria. That area is mostly pure sand. Because of the soil conditions, irrigation water should be applied in small amounts every two or three days during the summer months.

Published standard practices: Most published standard practices are available for reference in any Natural Resources Conservation Service office, or on the Internet. In general, there are three families of practices; agronomic, structural, and management. Some of the practices can be used independently, but in most cases, several practices must be applied to be fully effective in reducing pollution. The practices are only guides and must be adapted to fit site conditions. Each is formatted to provide an application standard, a specification guide, and a construction requirement. Some engineering practices are complex and may require the services of technical expert.

A list and abstract description of the most commonly applied standard practices is included in the main body of this text.

Biological management practices: The biological management practices listed in this document are methods to control predatory insects or destructive rodents that will reduce or eliminate the requirement to apply pesticides. The practices include habitat improvements for beneficial insects, mammals, and birds, management practices to eliminate predatory insect habitat, and the use of pheromones to trap or confuse predatory insects. Each practice could be applied independently, but the development of a holistic integrated pest management plan would be the most effective way to reduce reliance on pesticides.

A list and abstract description of the most commonly applied biological practice is included in the main body of this text.

Practice ratings: Each practice recommended was rated using six criteria. They include (1) Effectiveness in reducing NPS pollution, (2) Technical feasibility, (3) Probability of landowner acceptance, (4) Funding constraints, (5) Institutional constraints, (6) California Environmental Quality Act (CEQA). All of the ratings are subjectively based on past experiences. Items 1-3 are rated high, medium, or low. Items 4-6 are rated yes, no, or maybe.

Criteria (1) is the most important rating relative to the intent of this project. It is also relatively easy to rank. The Criteria (2) rating was based on the degree of difficulty in understanding or preparing the practice plans. Criteria (3) is largely a subjective opinion of what reaction could be expected from the general public. However, specific individuals might respond differently to certain proposals. What might be unacceptable to most might be embraced by others. Criteria (4) is largely a subjective rating similar to item (3). Item (5) is based on past experiences and is ranked according to the likelihood of requiring regulatory agency permits. Item (6) is based on the likelihood of actions required to satisfy CEQA requirements.

The practice ratings are shown in Table 5.7 in the main body of this text.

Special practice investigation: A literature and field review of the project area revealed that the most highly eroded areas are in the Cuyama River watershed. Most of the erosion is geologic in nature and cannot be reduced on site in significant volume within economic reason. Also, much of the erosion is on public land and there are several burrowing endangered species in the area so the installation of structural devices would pose significant institutional and environmental problems. Virtually none of the area could be protected with only vegetative means because of the extremely steep slopes and arid climate.

Since large-scale on-site erosion controls are limited, four areas within the Cuyama River were explored to see if it was technically feasible to install sediment retention basins to protect Twitchell Reservoir. Three of the sites are in Cuyama Valley and one is downstream of the Valley. The downstream location is referred to as the "Garcin Site". It can be found on USGS Chimney Canyon 71/2 minute quadrangle at 35^{o} 04' 10" north latitude and 120^{o} 10' 10" west longitude. This site could store approximately 9,000 acre-feet of sediment. Two of the sites in Cuyama Valley are located at the western end of the Valley. The western-most is the "Rock Front" location. It could store approximately 63,000 acre-feet of sediment. The second site ("Gypsum Canyon") is located immediately upstream of the Rock Front site. This location could store approximately 34,000 acre-feet of sediment. Only one of these locations could be used because the flood and sediment pool behind the Rock Front site would affect the Gypsum site. Both sites can be found on the Miranda Pine Mountain quadrangle. The fourth site, "Cottonwood Canyon", is shown on the Taylor Canyon quadrangle at Cottonwood Canyon. This site could store approximately 42,000 acre-feet of sediment.

Unfortunately, all of the sites would require some relocation of Highway 166 which would add a substantial cost to construction. No attempt was made to determine a benefit/cost ratio because much of the benefit would be based on extended service life and the value of water from Twitchell Reservoir, and none of these values has been established. In addition to the annually recurring value of water storage in the reservoir, there are other benefits. These benefits include additional flood control protection, additional water storage for conservation use until the basins fill with sediment, wetland habitat, and water based recreational opportunities.

Practice recommendations:

The practices recommended are minimum requirements to reduce non-point pollution under various land uses. Other practices may apply depending on site conditions.

- Agriculture, irrigated annual upland crops: The principal concern with upland farms is soil erosion and the resultant sediment and chemical transport off the farm. Soil losses can be substantially reduced by employing agronomic practices that can be installed at little or no extra cost. They include contour farming when feasible or cross-slope tillage if contour farming is not feasible, divided slope farming, installation of filter strips to act as buffers, and plant residue management. Permanent structural measures such as terraces and diversions may be necessary under some conditions. A cover crop should be considered if the fields are fallow during the winter.

In addition to erosion control measures, all essential practices listed in this document should be applied to reduce nutrient and pesticide transport. Other practices that should be considered are the installation of beneficial insect habitat in buffer strips, and bat and owl boxes to reduce the need for predatory insect controls and rodent controls.

- <u>Agriculture, Leveled irrigated annual crops:</u> Most parcels are precision leveled and maintained as necessary to facilitate gravity flow irrigation so there is minimal soil erosion. Nonetheless, some transport of silt and clay particles is inherent with this method of irrigation. The only feasible way to reduce off-site transport is to construct tailwater recovery systems that require a dedication of land and annual maintenance.

  Many of the drainage ditches are highly subject to bank failure because they are deeply incised with side slopes that are less than 1:1. This erosion concern can only be corrected by reshaping the ditches with increased side slopes, or lining with concrete. Either of these practices would be expensive.

  All essential practices listed should be employed to reduce nutrient and pesticide transport, and a winter cover crop should be considered if the fields are to be fallow during the winter.

- <u>Agriculture, irrigated perennial crops</u>: There is a great variety of irrigated perennial crops in the project area, including sub-tropical fruits, deciduous fruits and nuts, and wine grapes. Site conditions are as diverse as the crops and non-point erosion control requirements vary accordingly.

  All of the sub-tropical fruits are located in the Nipomo and Bull Canyon area of San Luis Obispo County. Most of the orchards maintain cover crops for erosion control until the orchards mature. At maturity, large amounts of leaf litter provide adequate ground cover and preclude the need to maintain the cover crops.

  Almost all of the deciduous fruits and nuts are located in Cuyama Valley, and there is a growing wine grape industry in the same region. All of the crops are located on modest slopes rarely exceeding five percent. Annual rainfall is less than 10 inches. Because of the low rates of precipitation and modest slopes, in most cases control of sheet and rill erosion is not a concern. Nonetheless, some growers maintain cover crops to create habitat for beneficial insects.

Most of the wine grape plantings are located in the rolling foothills and mountain interface around Santa Maria Valley. This industry is growing rapidly displacing land that was primarily used as pastures for grazing beef cattle. Slopes range from nearly level up to approximately 50 percent although most fields rarely exceed 30 percent slope. Non-point source pollution associated with erosion are universally addressed by the installation of annual cover crops, and in some cases structural devices are installed to reduce slope lengths. Most orchards could further reduce sediment losses to watercourses by installing vegetated buffer strips adjacent to the channels. The bulk of soil lost to erosion is from clearly discernable and discrete sources that are considered "point" sources of pollution and beyond the scope of this document.

All essential and biological control practices listed in this document should be considered to reduce off-site transport of chemicals, and in fact, most growers do currently apply most of them. In general, the wine grape industry is by far the most progressive in applying environmentally friendly biological practices for pest controls, and close water management for chemical controls.

- Agriculture, range land: In 1995 the State Water Resources Control Board endorsed the California Rangeland Water Quality Management Plan as a component of the State's Non-point Source Pollution Control Plan. The management plan is based on a strategy of landowner self-assessment and development. To facilitate implementation, numerous short courses on range management were proposed for livestock operators. Several well- attended courses in this area have been completed to date and at least one more is being offered.

  The self-initiated approach has three levels of development. The first level requires a simple letter of intent from the landowner. This usually applies when there are minimal non-point source pollution concerns, or if there is an existing management plan for the property. There is no requirement that the letter be filed with any agency; however, filing the letter is an option for landowners to consider. The letter would be used as a negotiating tool if water quality issues should arise. The second level requires an inventory of resources, problem assessment, statement of goals, and documentation of management practices. This plan also has the same optional filing as the letter of intent. The third level is the preparation of a formal plan and requires filing with the Regional Water Quality Control Board. Such plans would enable the operator to be eligible for various agency grants if capitol investment to achieve water quality objectives were prohibitive.

- Agriculture, Dry farmed annual crops: In 2000, there were approximately 7,500 dry farmed acres in the project area. Many of the farmers that raise dry farmed crops participate in various benefits programs sponsored by the federal government.   Participation in such programs requires that the NRCS assess each field to determine if there are concerns for sheet and rill erosion. If erosion concerns are identified, the landowners are mandated to apply conservation practices reduce the erosion potential to prescriptive limits.

Erosion is difficult to control each year because of crop rotation practices, so most plans are based on average annual losses. Some of the rotations involve spring plantings. In order to maintain adequate soil moisture the fields are cleared of vegetation during the critical winter months.

Various structural measures such as terraces could be employed to reduce erosion at some sites, depending on the topography. Management and vegetative practices such as strip cropping, or establishing permanent vegetative buffer strips are also effective.

Owl and bat boxes should be considered at all locations to provide a biological means for rodent and predatory insect controls.

- Mined land: All mining activities are regulated by various agencies, including abandoned sites. Most forms of pollution that might be generated are considered point sources, except soil erosion. Some abandoned sites and a few active locations have accelerated erosion concerns. Each location is unique and requires on-site analysis of erosion concerns.

- Public land (federal): Public lands in this project area are managed by the Bureau of Land Management (BLM) and the Forest Service (FS). Both agencies have extensive plans that address the issues of concern in this project. In view of this circumstance, no other measures were recommended.

- Urban land: All urban communities have extensive outreach programs and legal authority to reduce introduction of pollutants into the environment. Nonetheless, there is still significant illegal dumping of garbage and household waste products. The only practical was to stop the illegal dumping is through education starting at a very early age, and strict enforcement and prosecution of violators.

  Salts from recycling water softeners are also a problem. This concern has been somewhat reduced with the importation of high quality water in the City of Santa Maria, but it is still a concern in other areas. The only way to reduce this concern is through ordinances that prohibit the use of the recycling softeners, or improving the quality of water. Neither alternative appears to be economically, or politically feasible at this time.

Based on irrigation system evaluations taken on large turf grass areas within the urban community, it appears that there could be significant improvement in irrigation practices at the household level. Most of the poor efficiencies associated with urban landscape irrigation are usually relatively easy to correct and involve such things as plumbing leaks, obstructions in the wetted pattern, and broken or mismatched parts.

- Rural residential: Rural home sites represent a relatively small fraction of the overall land use. Management practices to reduce pollution concerns require on-site analysis because of the varied land uses that range from preservation of the natural landscape to intensive uses such as raising livestock or farming.

6. IMPLEMENTATION PLAN – NPS POLLUTION PROGRAM

Overview: Non-point source pollution is an insidious process and in many cases, improvements may not be recognized for an extended period. Faced with that reality, perhaps the single largest obstacle in establishing an implementation program is convincing the public that there is a concern and have them accept the fact that they are part of the problem and should be part of the solution.

Many practices are can be used to reduce pollution. They range from relatively simple easily understood practices to relatively complex practices that require technical assistance. Many of the practices come with a cost; however, all of the practices are cost-effective when amortized over the life of the practice. Some practices, particularly work in stream channels or other wetlands, require permits from various regulatory agencies.

State Water Resources Control Board NPS goals and implementation strategy: The SWRCB goals of the NPS program are to:

- Improve water quality by 2013;
- Implement a comprehensive statewide program;
- Target implementation actions;
- Forge strong relationships with agencies and individuals that must be involved in the implementation;
- Improve public awareness.

The plan implementation strategy is based on a long-term commitment to local stewardship backed up by regulatory authority to achieve the goals. This strategy employs a three-tiered approach. Under Tier 1 landowners voluntarily implement practices that achieve water quality standards by self-determined analysis and application. Tier 2 allows the Regional Water Quality Control

Boards to use regulatory authority to encourage practice implementation. Under this authority the Board may waiver discharge requirements under the condition that progress is made in installing improvement measures. As an alternative, the Board can enter into agreements with other regulatory agencies to enforce implementation. Under Tier 3 the Board specifies effluent limitations for waste water discharges and require that landowners meet the requirement.

Public awareness: There is a need to inform the general public of the non-point pollution concerns and at the same time convey a message that all citizens are responsible for pollution and should be part of the cleanup. The urban public needs to be informed about agricultural issues, and they need to be aware of and recognize the many on-going efforts by agriculture to improve the environment. A constructive dialog needs to be established rather than a confrontational approach that is typically found in the various media.

Outreach/Education – Agricultural community: Most of the non-point sources of pollutants identified in this project area are a result of agricultural activities. Not because farmers and ranchers are poor stewards of the land, but primarily because those industries by far occupy most of the land and use most of the water. The contaminants that are produced on individual parcels may be small, but collectively they are significant. In order to combat this concern an industry led coalition should be established to address the issues of concern. The function of this coalition would be to get a consensus that there is a problem, that all are part of the problem and all should make an effort to mitigate the concern. One approach to be considered would be to establish a pilot project for farmers that is similar to that approved for the ranching community. In effect, this would allow farmers to prepare a self-assessment of their property, and prepare and implement an improvement plan. Technical assistance could be made available through the Resource Conservation District, Cooperative Extension Service, Natural Resources Conservation Service, and others with interest in the project.

Outreach/Education – Urban Community: Both city and county governments have extensive education and outreach programs dealing with issues that contribute to non-point source pollution. These programs include such issues as recycling product containers, green waste pickup and composting, and proper disposal of hazardous waste. More recently, there has been a concerted effort to reduce or eliminate water softeners in areas that have high quality imported water. Nonetheless, significant improvement that could be made with irrigation practices and proper use of pesticides and fertilizers.

Littering and improper dumping of household trash is a continuing problem. Outreach may be possible to reduce these practices, however, strict enforcement and punitive actions may be the only way to stop it. Education and outreach would be most effective if it were concentrated in the schools. Littering is common on many of the local school campuses, and the habit is probably continued in the adult years.

Technical support: Many of the practices required to reduce non-point sources of pollution require technical assistance. Assistance is available through various agencies, but the number of staff is limited. Allocating resources to increase staff to assist in designing preventive measures would be more cost-effective and certainly a more palatable approach than cleanup through a regulatory approach.

Many technical services are available through the private sector, but they are usually limited to specialized areas. Also, technical services for some of the practices such as irrigation system evaluations are only available through agencies such as the RCD or the Cooperative Extension Service

Technology transfer: A wealth of information is available concerning water quality and related natural resource issues. However, much of this information is scattered among agencies and in many cases, it is focused on single issues of concern such as soil erosion control. Monitoring of water quality is similarly scattered and sporadic. In some areas, it is lacking entirely. A budget and staff time should be provided to gather information and establish a comprehensive list of the information available including a reference list of private and agency technical services. This information should be made available for immediate reference through the Internet, local libraries and similar sites.

When information is presented, it is usually by specialists focusing on single issues. This fragmented approach makes it difficult for land managers to consider impacts on related issues and make integrated management plans. Informational links to related subjects should be provided at all workshops. One of the most effective ways to convey information is through peer advisory groups. Peer influence is always effective because they are based on on-the-ground experiences.

Water quality monitoring is conducted by a variety of agencies, but there is little cooperation or correlation of monitoring sites. Many of the measurements taken are sporadic and not always at the previous measuring site. One entity, such as the County Water Agency, should be established to maintain a central database and to correlate activities between the various agencies that monitor water quality.

Institutional constraints: One of the biggest obstacles landowners face when wanting to install measures that could improve water quality is the myriad of agency reviews and permits required. Approval of plans that might affect the environment is important; however, many of the regulatory agency requirements are redundant and in some cases contradict requirements by others. In most cases, regulators meet with the landowners individually which makes the process time consuming and expensive. There are no fee reduction or waivers if projects clearly benefit the environment. The concerns about the permit processes have been discussed many times both locally and statewide, but little has been accomplished to alleviate the situation. There are a few counties in the state that have established modest programs to facilitate permit processing, but they are limited in scope. This issue needs to be reconciled, not only at the local level and state level, but throughout the country. There is a desperate need for a one stop permit processing center, and a review and elimination of redundant requirements between agencies.

Technical and financial assistance sources: The principal local agencies available for technical assistance include the Cachuma Resource Conservation District, Natural Resources Conservation Service (NRCS), U.C. Cooperative Extension Service, and Pacific Gas and Electric Company (PG & E). Numerous private firms also offer technical services. Most advertise in the telephone directory.

Local agencies that provide financial assistance include the NRCS, PG & E, and the Farm Services Agency. However, this assistance is limited, and usually applies to specific topics. Numerous state and national public agencies and private foundations also provide grants for projects that are related to natural resource improvements. A detailed list of some of the grantors is available through the University of California on the Internet at http://ceres.ca.gov/foreststeward/funding.html.

Section 7. RIPARIAN HABITAT IMPROVEMENTS

Site selection: A technical advisory sub-committee composed of representatives with a variety of natural resource and technical backgrounds was formed to assess the conditions of the riparian habitats. Four comprehensive field trips were completed to determine if and where improvements were needed, and to develop goals and objectives for any proposed restoration sites. A consensus opinion of the group determined that most of the rural streams were in relatively good condition with the exception of the Cuyama River in the reach extending throughout most of Cuyama Valley. However, several sites within the constructed waterways of Santa Maria Valley were identified for improvement; including the Santa Mara River, and various flood control facilities near the City of Santa Maria and Orcutt.

Cuyama River: The reach extending from the western end of Cuyama Valley to about Old Cuyama was identified as having damaged habitats at all outside meanders of the river because of severe bank erosion. However, it was determined that it would be too costly an undertaking to correct the problems because some form of structural measures would be required at each location to provide stability. In the upper valley, extending throughout the farmed area, severe bank erosion and a resultant loss of cover was also noted. Numerous attempts have been made in the past to correct the problems but most have not provided permanent stability. The banks are very low in this reach and might benefit from an extensive planting of woody vegetation. However, there are institutional problems with regulatory agencies which might make this a difficult process, and it is very arid and irrigation would be required for an extended period to assure plant survival. Nevertheless, river corridor plantings should be considered at least on a trial basis.

Santa Maria River: The Santa Maria River was identified as having extensive opportunities for riparian habitat improvement throughout the constructed reach that extends from Fugler Point to Highway 1 near Guadalupe. The recommendation is to create linear plantings on the stream side of the levees throughout the system. These planting would have an average width of 50 feet and would be composed of wetland associated woody plants. The plantings would be established and maintained by irrigating with agricultural tailwater. Using the tailwater will also benefit the groundwater system by bio-scrubbing nutrients. All of the plantings would be on property currently in public ownership. Approximately 220 acres of potential habitat could be created. The plantings would also serve as a protective buffer for the levees.

Bradley Basins: The Bradley Basins consist of two flood control facilities connected in tandem. They are located adjacent to the northbound lanes of Highway 101approximatelu 0.5 miles south of the Santa Maria River bridge. These basins collect water from both agricultural and urban runoff. They retain water at maximum pool year-round because of agricultural tailwater. Overflow continues through a constructed channel to the Blosser Basin. This area has modest wetland bank cover, but lacks adequate nesting and escape cover for waterfowl. The site would also benefit form upland tree and shrub plantings around the margins. Animal nesting boxes would also be included with the plan. A security fence would be required to prevent vandalism and wildlife depredation from feral and domestic animals.

This area around this site is rapidly becoming urbanized. An alternative would be to create a water-based recreational facility. The ponds would probably support a self-sustaining warm water fishery, and it could be used a put and take trout fishery during that part of the year when water temperatures were adequate.

Blosser Basin: The Blosser Basin is located at the north end of Blosser Road. It currently serves a flood surge protection device. Current plans include the annexation of an adjacent abandoned gravel pit that will be incorporated into the flood control operation. Low flow winter runoff is plumbed to bypass the pond and discharge directly into the Santa Maria River. Summer tailwater flows are also discharged directly into the river. Habitat improvements would be similar to the Bradley Basin site, but on a much larger scale. This area would not be suitable for a warm water fishery. It might be functional as a put and take trout fishery, but the best public use would be as an outdoor classroom.

California Street Basin: The California Street Basin is located near Old Orcutt. It is principally used to trap sediment produce in Orcutt Creek. There is no residual surface runoff of substance following storms. This site would benefit through the establishment of peripheral woody plantings to enhance the immediate habitat, and provide a connecting link with excellent riparian habitat located immediately upstream.

Mud Lake Basins: The Mud Lake Basins consist of a complex of three flood and sediment control facilities. They are located in Orcutt approximately 0.3 miles south of Highway 101 near the Ralph Dunlap School. The area would be improved through the addition of transitional and upland vegetative cover, and the installation of animal nesting boxes. It would make an excellent outdoor classroom site. The entire area is protected by a security fence.

Other sites: One of the strategies to protect Twitchell Reservoir from accelerated sedimentation would be to build sediment retention basins in the Cuyama River. If any of these sites prove to be economically feasible to construct, they would provide outstanding opportunities for creating wetland habitats and for outdoor recreational pursuits.

The historic Betteravia Lake has a potential surface area of 974 acres because of a natural land depression within Orcutt Creek. This area has been annually drained by pumping following each winter runoff to permit farming. The flooding is occurring with increasing frequency because of the rapid urbanization in the upper watershed and the resultant increase in runoff. This area may become financially infeasible to reclaim sometime in the future because of energy costs. If that scenario should occur it would be an opportunity to create an extremely high value wetland on at least part of the historic lake.

Santa Maria River Watershed Non-Point Source Pollution Management Plan

Section 1 – INTRODUCTION

In 1997, the State Water Resources Control Board (SWRCB) identified the Santa Maria River Basin as having significant water quality impairment primarily as the result of non-point sources of pollution. Because of this concern, the Central Coast Regional Water Quality Control Board listed the basin as a priority watershed in a request for planning grant proposals under Section 205(j) of the Federal Clean Water Act. The Cachuma Resource Conservation District (RCD) applied for a grant under that program and was subsequently approved by the SWRCB to complete a problem assessment and mitigation plan to reduce non-point sources of water pollution. As part of the plan damaged riparian habitats were also identified and practices were recommended to improve wildlife values. The project was completed as a cooperative effort with contributions from many agencies, farming organizations, and private individuals.

1.1 Purpose:

This plan was developed to identify non-point sources of water pollution in both the surface and groundwater of the Santa Maria River Watershed and recommend management strategies and funding sources to mitigate the impairment concerns. As a related issue, degraded riparian habitats were also identified and repair practices were recommended.

The U.S. Environmental Protection Agency (EPA) provides the following description of ***non-point*** pollution "….the pollution of our nation's waters caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural pollutants and pollutants resulting from human activity, finally depositing them into lakes, rivers, wetlands, coastal waters, and ground waters. In addition, hydrologic modification in the form of non-point source pollution that often adversely affects the biological and physical integrity of surface waters."

Point sources are defined as "any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or might be discharged. <u>This term does not include agricultural storm water discharges and return flows from irrigated agriculture</u>."

1.2 Objectives:

The objectives of this plan are to:

(1) Summarize the watershed attributes,

(2) Identify and assess non-point sources of water pollution,

(3) Recommend appropriate management practices and implementation strategies to mitigate water quality concerns related to NPS pollution, and

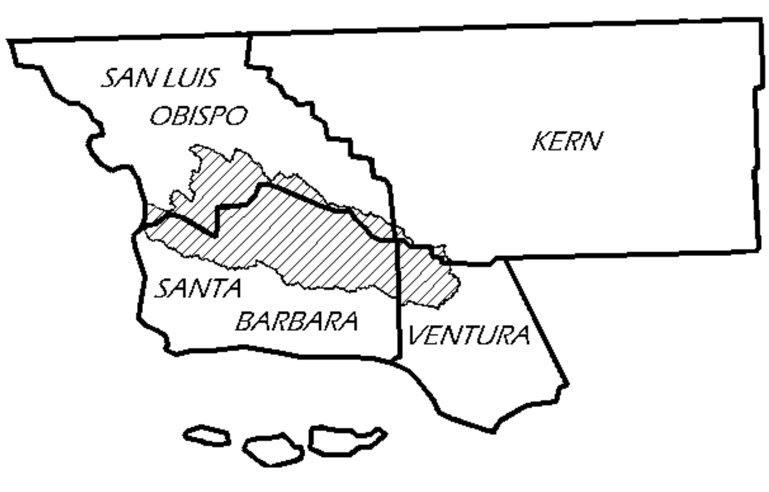
(4) Identify degraded riparian habitats and recommend practices to improve the degraded conditions.

1.3 Planning Area:

For the purposes of this plan, the watershed area includes the Santa Maria, Cuyama, and Sisquoc Rivers and all of their tributaries. In addition, Orcutt Creek, Oso Flaco Creek, and several unnamed watersheds within Santa Maria Valley are included in the plan. (Orcutt Creek discharges into the Santa Maria River delta at about elevation 12 MSL. Oso Flaco Creek drains through a series of freshwater lakes in the sand dune area approximately 5 miles north of Guadalupe.) Two major historic tributaries to the Cuyama River, Huasna River and Alamo Creek, now merge with the Cuyama River waters through Twitchell Reservoir. Collectively, the planning area is approximately 1,870 square miles (1,196,800 acres). The basin drains most of northern Santa Barbara County, southern San Luis Obispo County, the northwest quadrant of Ventura County, and a relatively small part of southwestern Kern County.

There are approximately 3,090 miles of streams in the drainage basin. In general, the watershed is relatively steep. In the Cuyama River basin, about 25 percent of the area have slopes in excess of 25 percent. The Sisquoc River drainage is steeper with about 35 percent of the basin having slopes greater than 15 percent. Approximately 16 percent of the Cuyama basin is protected from development because of public ownership. In the Sisquoc/Santa Maria River basin, about 42 percent of the land is in public ownership with the majority of it within the Sisquoc River watershed. Management of the public lands is vested with the USDA-Forest Service and the USDI-Bureau of Land Management. Figure 1.3 is an approximate definition of the watershed planning area. A more complete map is contained in Appendix “A” (5 sheets).

Figure 1.3. Santa Maria River Watershed Planning Area.



1.4 Methods:

1.4.1 Technical Advisory Committee (TAC) – A TAC was formed Immediately after the project was authorized by the SWRCB. The membership included representatives from all levels of government, technical agencies, farm and ranch organizations, and the public. The purpose of the TAC was to guide the development and form of the project, provide technical input, and review the product. At the first TAC meeting several sub-committees were formed to address specific elements of the plan. For the most part the sub-committees were composed of technical experts. Issues addressed by the sub-committees were wetlands (riparian zones), irrigated agriculture, urban and rural low density, rangeland, and mapping requirements. During the development of the project the sub-committees were an invaluable source of information.

1.4.2 Data Collection – A literature search was completed and data was compiled to assess documented water quality impairments. In addition, various related documents such as soil surveys and geology reports, aerial photos, and various maps were researched for relevant information. Field surveys were completed as necessary to update existing land use maps, and to document degraded riparian habitats. Water quality sampling, and analysis of surface waters within Santa Maria Valley, was completed at strategic locations to augment existing data. Maps were developed as required to identify the hydrologic provinces and land uses.

1.4.3 Plan Development – A management strategy was prepared based on an assessment of documented and potential water quality concerns related to specific land uses. In addition, a strategy was developed for enhancement or repair of degraded riparian habitats. As part of the assessment and planning process, existing or proposed programs protecting water quality were incorporated into this plan. In some cases planning recommendations were limited because of the need for additional study. Such needs are noted in the implementation strategies. The land uses addressed in the plan include:

- Agriculture, irrigated upland annual crops
- Agriculture, irrigated leveled annual crops
- Agriculture, irrigated perennial crops
- Agriculture, rangeland
- Agriculture, dry farmed crops
- Mined land
- Public land (federal management)
- Urban
- Rural residential
- Wetlands (principally riparian)

1.4.4 Public Participation – Throughout the plan development various public were included on the TAC. In addition, interviews were conducted with individual landowners, and operators. Two public meetings were held to solicit public comment and responsive summary comments were prepared.

Section 2 - RESOURCE INVENTORY

2.1 Surface Water Descriptions:

Santa Maria River: The Santa Maria River is a relatively modest reach in the drainage basin with a length of only about 25 miles. It extends from the confluence of the Cuyama and Sisquoc Rivers to the Pacific Ocean. The drainage area that flows into the river downstream of the confluence is approximately 205 square miles (131,142 acres); however, all surface waters in this project area except Oso Flaco Creek enter the river at some point.

For all practical purposes the Santa Maria River, as well as all other drainages within Santa Maria Valley, has been artificially created in the latter part of this century because of constructed water control devices. For most of its length (approximately 19 miles) the river is contained by a levee system. The levees end on the eastside of Highway 1 near Guadalupe. From that point to the ocean, it assumes a relatively natural meandering course – a distance of approximately six miles. An important characteristic of the river is that the outlet migrates north and south periodically. Prior to the 1860's, the outlet was 7 kilometers (~4.3 miles) north which is in the proximity of Oso Flaco Lake (Cooper, 1967). Hydro modifications since that time have permanently altered the river course so that it now enters the ocean in the proximity of the current outlet. Nonetheless, the river outlet location can change rapidly as evidenced in 1995 when the river migrated north approximately one mile north of its typical location.

Other major drainage modifications include the Bradley Canyon, Bradley Drain, and Blosser diversions. The Bradley Canyon diversion intercepts waters generated near Garey and diverts it northerly into the Santa Maria River. That diversion is located approximately three miles east of Santa Maria. The Bradley Drain is located along Highway 101 in Santa Maria. It intercepts much of the storm-water generated between the Bradley Canyon diversion and Santa Maria, and diverts it northerly into the Santa Maria river. The Blosser diversion intercepts water generated within Santa Maria and it also diverts into the Santa Maria River. Most of the land west of the Blosser drain and north of Highway 166 is channeled into multiple individual watersheds and directed north to the Santa Maria River.

Orcutt Creek (a.k.a. Solomon Creek): Orcutt Creek drains most of the southwest quadrant of Santa Maria Valley including the town of Orcutt and the unincorporated urban area surrounding the town. This stream is actually a tributary to the Santa Maria River, but it does not merge with it until it nears the ocean at about elevation 12. It is likely that it becomes brackish at this point during winter months when there are high tides and surf. The total drainage system is 52,142 acres.

The entire watershed is contained through an elaborate, and complex, storm-water control system that includes channels, sub-surface drains, surge basins, and percolation basins. Perhaps the most significant alteration to the historic flow pattern was the drainage of an historic lake near Betteravia. The drainage required pumping because it was, and still is, a land depression within the creek. The lake bottom is currently farmed, and is still subject to frequent flooding. During extremely heavy storms, a lake surface area of approximately 970 acres is created before gravity flow to the ocean occurs.

Oso Flaco Creek: Oso Flaco Creek drains most of the agricultural area in that part of Santa Maria Valley that is within San Luis Obispo County. The hydrologic area is approximately 7,400 acres. The stream channel is, for the most part, constructed. It is the primary water source for Little Oso Flaco and Oso Flaco Lakes. The lakes are usually at maximum pool because they are nourished by agricultural tailwater throughout the year in addition to winter runoff. The lakes overflow into a relatively short reach of creek before exiting into the ocean. Earlier in this century, some of the floodwaters from the Santa Maria River were routed through Oso Flaco Creek. The access was permanently blocked at an unknown date.

Sisquoc River Basin: The Sisquoc River originates near Big Pine Mountain in the San Rafael Wilderness area of the Las Padres National Forest. The San Rafael Mountain range on the south and the Sierra Madre Mountains on the north form the drainage basin. The opposing slopes of the respective ranges flow toward the Santa Ynez basin and the Cuyama River basin. Both mountain ranges have very steep slopes and numerous high peaks, the highest of which is San Rafael Mountain at 6,593 feet. The watershed encompasses approximately 475.5 square miles (304,326 acres), about two-thirds of which is within the wilderness. The stream flows almost directly west until it merges with the Cuyama River.

All of the mainstem of the river that is within the national forest has a Scenic River designation. It is a perennial stream throughout that area, and contains a healthy, self-sustaining, rainbow trout population. The western most reach has a rather pervious river bottom so flows recede rather quickly because of rapid percolation rates in that area. In addition, there is a diversion for agricultural irrigation on the Sisquoc Ranch that may contribute to the rapid recession. In the lower reaches, near the confluence with the Cuyama River, there are extensive gravel mining operations. The major tributaries are Manzana Creek, La Brea Creek and Tepusquet Creek. About 80 percent of the watershed is within the national forest.

Cuyama River Basin: The Cuyama River is by far the largest hydrologic province in the planning area encompassing almost 1,074 square miles (687,360 acres) to Twitchell Reservoir. (Included is the Huasna River and Alamo Creek tributaries that now merge with the Cuyama River at the dam. These tributaries are the largest in the Cuyama River drainage basin at 103 (65,920 acres) and 86 square miles (55,040 acres), respectively.) The drainage area below the dam is approximately 14,430 acres. The watershed drains much of southern San Luis Obispo County, northern Santa Barbara County, the northwest corner of Ventura County, and a small part of the southwest corner of Kern County. The headwaters start on the western slopes of the mountains surrounding Lockwood Valley in Ventura County. The river generally trends to the northwest throughout

Cuyama Valley. At the western end of the valley, it abruptly assumes a southwest course to Twitchell Reservoir. Most of the northern watershed boundary is the Caliente Mountain range. The south boundary is the Sierra Madre range. Many of the mountain peaks are in excess of 5,000 feet, the highest of which is Peak Mountain in the Sierra Madre range at 5,843 feet. Cuyama Valley is at a relatively high elevation ranging from about 1500 feet on the western end to about 3,500 feet on the eastern end.

Most of the river mainstem west of Cuyama Valley to Twitchell Reservoir has been altered. In part by the reservoir and road relocations to accommodate its construction, and in part by other road relocations not associated with the reservoir. Construction of the reservoir was completed in 1958. As part of that effort, Highway 166 was relocated from within the water storage pool and upstream to about the junction of Tepesquet Road. During the process, several major stream meanders were removed. Approximately 20 years later the road section between Tepesquet Road and the western end of Cuyama Valley was also relocated from an upland area to the Cuyama River gorge. Because of that relocation, numerous major stream meanders were removed from the watercourse. From the western end of Cuyama Valley upstream to the stream's origin near Mt. San Guillermo in Ventura County the watershed is relatively unchanged. However, there are bank erosion control devices in the farming region at the eastern end of Cuyama Valley, and road armoring along Highway 33 in the general vicinity of Ozena.

Twitchell Reservoir (a.k.a. Vaquero Dam): Twitchell reservoir is located on the Cuyama River approximately six miles upstream of the confluence of the Cuyama and Sisquoc Rivers. The Cuyama River is the county line between Santa Barbara and San Luis Obispo counties, so the storage area is shared. The reservoir was designed and constructed by the U.S. Bureau of Reclamation. Downstream levee facilities built to contain the Santa Maria River were constructed in the same era by the U.S. Army Corps of Engineers (COE). The dam is an earth-fill embankment with a crest length of 1,804 feet. The top of the dam is at an elevation of 692 feet MSL, which is 218 feet above the original streambed. The primary spillway consists of an inlet tower, a series of conduits and tunnels, and a chamber housing control gate valves. The emergency spillway is a concrete-lined shaft bored through the mountainside in the western abutment. The emergency spillway invert is at elevation 651.5. The designed water storage capacity was 240,113 acre-feet with a maximum surface area of 3,690 acres.

The reservoir is operated for flood control, and as a water conservation device. There is no recreational use by the public. The designed storage volume dedicated to water conservation was 151,045 acre-feet. The remaining 89,068 acre-feet is reserved for flood control. A 1997 study completed by the Santa Barbara County Department of Public Works, Water Resources Division, indicated that approximately 44,000 acre-feet of sediment has accumulated in the reservoir at an average annual rate of 1,040 acre-feet. Almost 91 percent (40,000 acre-feet) of the accumulated sediment is located in the water conservation pool. After that study was completed there was an extensive wildfire largely concentrated in the Alamo Creek watershed. This was followed by an abnormally high rainfall year *(El Nino)*. Because of this condition, it is estimated that an additional 8,000 to 10,000 acre-feet of sediment had been deposited in the reservoir. Almost all of the sediment is deposited in the water conservation pool resulting in about 30 percent reduction in storage capacity.

Management of the reservoir is the responsibility of the Santa Maria Valley Water Conservation District (WCD); however, operation of the flood control pool is under the authority of the COE. Under normal operations, water is allowed to accumulate during the rainy season up to the conservation pool elevation (623 MSL). After the conservation pool is filled, the COE dictates releases from the surcharge area. To date all of the winter flood control releases have been made through the primary spillway which has a gate opening capacity of approximately 12,700 cubic feet per second (cfs). In the dry season, after surface flows from the Sisquoc River have ceased, water is released to recharge the Santa Maria Valley groundwater basin. The release rate is metered so that surface flow in the Santa Maria River will not pass Bonita School Road. (Bonita School Road is located near an interface between highly permeable river soils and an area of confining layers.) The road is used as a dry weather crossing, and is located approximately 4.5 miles west of Highway 101. The average annual groundwater recharge gained from the metered releases is estimated to be approximately 20,000 acre-feet.

Dune Lakes: The dune lakes complex related to this project include Oso Flaco Lake, Little Oso Flaco Lake and a small unnamed lake located in the general vicinity. The lakes are located in the extreme northwest corner of the planning area, and are unique in that they are freshwater bodies located in the ocean dune sands. The surface areas of open water are approximately 50, 40, and 9 acres, respectively. The collective wetland habitat, including the associated wooded and marsh habitat, is approximately 169 acres. The lakes are extremely important to migratory waterfowl as well as resident species. Historically the area was owned by UNOCAL, and relatively free access was permitted for a variety of recreational purposes. The property has since been acquired by the state, and is currently managed as a wildlife area. Passive recreational use such as bird watching and hiking is permitted.

Historically the lakes shared the same drainage as the Santa Maria River during periods of high flows. The drainage was altered early in this century so the hydrologic province is now only about seven square miles. The lakes are now largely dependent on agricultural tailwater to maintain a maximum pool.

Betteravia Lakes: Betteravia Lakes are a series of open water ponds and interconnecting sloughs extending from Black Road to Betteravia. The complex is in part because of land depressions, and partly because of constructed facilities. The lakes were originally used extensively as wash water by a sugar beet processing plant located in Betteravia. The plant has since been closed and the surrounding land is now used for irrigated agriculture. The wetlands are largely sustained by winter runoff and to a lesser extent by agricultural tailwater. Most of the Santa Maria Airport drains to this area so runoff is relatively high considering the hydrologic province because of the impervious surfaces in the airport.

Bradley Lake: Bradley Lake is located about halfway between Santa Maria and Orcutt approximately one mile east of Highway 101. The original lake was formed because of a natural depression. It was enlarged many years ago (time unknown) by a constructed dam. It is now used primarily as an irrigation-regulating reservoir, and to a lessor extent for flood control.

Estuaries: There are only two water outlets to the Pacific Ocean in this project area, Oso Flaco Creek and the Santa Maria River. Oso Flaco Creek spills from a heavily vegetated channel at the outlet of Oso Flaco Lake directly into open marine sand before entering the ocean. Conversely, the Santa Maria River floodplain is a dynamic mixture of Marine, Estuarine, Riverine, and Palustrine wetland habitats. The extent of the habitats varies over time because the river channel migrates within the floodplain. The area has a great abundance of wildlife and plant species because of the diversity in habitats. Numerous sensitive species have been documented or presumed to use the area while foraging. The estuary is also used by huge flocks of migrating birds as an area for foraging breeding, and resting.

Constructed ponds: There are numerous constructed ponds located throughout the planning area. They vary in size, from one to over 100 acre-feet of storage. Ponds located in rangelands were constructed primarily as livestock watering facilities; however, they are used extensively by wildlife. All of those facilities are nourished by winter runoff, and many go dry early in the summer season because of evaporation and consumptive use.

In the farmed areas, almost all of the ponds, except tailwater recovery systems, are built out of drainage areas to prevent silting. They are usually used as irrigation regulating reservoirs, and filled with water pumped from underground sources according to irrigation demands. Most of the ponds associated with farming enterprises are located in, or near, Santa Maria Valley.

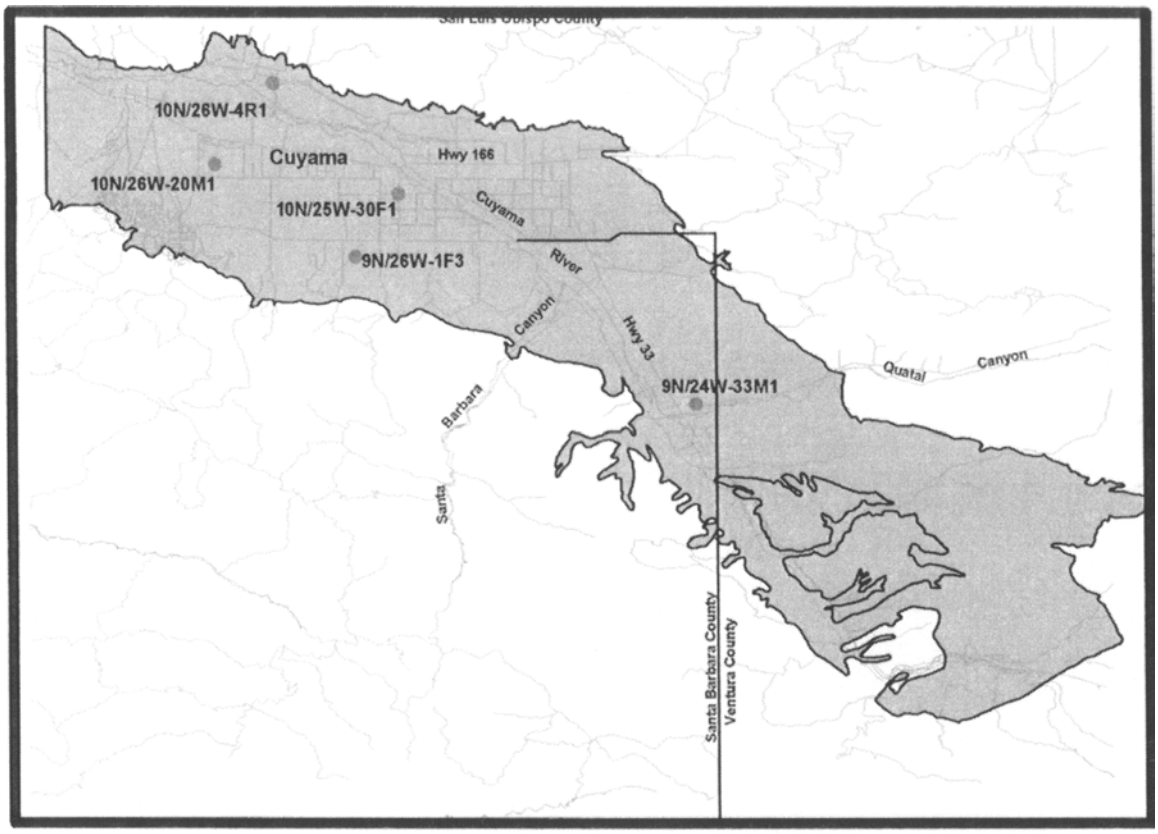
In the Santa Maria urban area, there are numerous constructed ponds that are used for flood control, sediment retention, groundwater recharge, or a combination of those purposes. Some of the ponds also collect agricultural runoff in addition to the urban runoff.

2.2 Groundwater Descriptions:

Cuyama Valley: The Cuyama Valley groundwater basin is primarily located in southeastern San Luis Obispo County and northeastern Santa Barbara County, but there is a modest intrusions into Ventura county and a relatively small part of Kern County. The basin was first mapped and an estimate of perennial yield was completed by the U.S. Geological Survey (Upson & Worts, USGS) in 1947 and updated in 1966 (Singer & Swarzenski, USGS). The mapping includes the Cuyama valley from a point near Cottonwood Canyon eastward, presumably because there was limited development of the groundwater west of that area. The same pattern of use exists with almost all of the water development confined to an area from about New Cuyama eastward to Ozena Valley.

The mapped basin is about 24 miles in length, two to six miles wide, and trends from southeast to northwest. Nearly all of the groundwater is in alluvium and terrace deposits of unconsolidated clay, silt, sand, and gravel ranging in thickness from 3,000 to 4,000 feet. Most of the groundwater body is unconfined, but movement is restricted by faults. The faults largely restrict water movements west of the mapped area, hence the limited water development in the western end of the valley.

Figure 2.2A. Cuyama Valley Ground Water Basin.



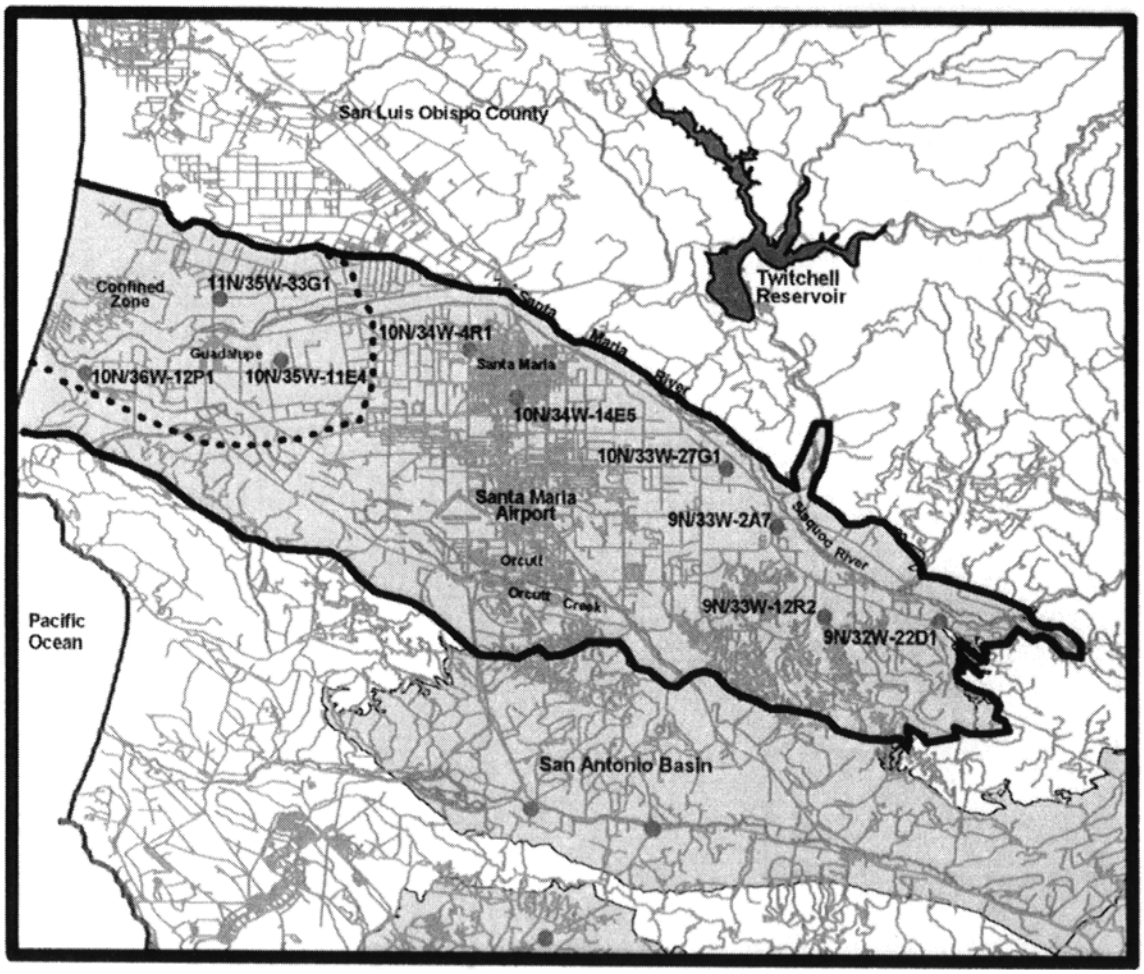
Santa Barbara County Water Agency: Santa Barbara County 1999 Groundwater Report.

Santa Maria Valley: The Santa Maria groundwater basin covers an area of approximately 260 square miles and is largely located in the northwest corner of Santa Barbara County between 34^{o}50’ and 35^{o}05’ north latitude and 120^{o}10’ and 120^{o}40’ west longitude. It includes all of the valley area and most of the terraced uplands surrounding the valley including a significant part of southwestern San Luis Obispo County in the Oso Flaco and Nipomo Mesa regions. The basin is composed of permeable beds of gravel and sand that are locally separated by relatively impermeable beds of silt and clay. It is bounded by consolidated impermeable rock formations that outcrop along the periphery of the basin. The unconsolidated water bearing deposits vary in thickness to about 2,800 feet. The average thickness is about 1,000 feet. The main groundwater body is estimated to have a storage volume of approximately 100 million acre-feet with 20 million acre-feet above MSL.

The basin was first described by the USGS in 1951 based on an investigation completed in the 1940's. A second report was completed by the USGS in 1966 to reappraise the estimates of perennial yield through an analysis of additional geologic and hydrologic data collected after the original report was published. The purpose of the second report was to evaluate the effects of Twitchell Dam and because of a concern with overdraft of the basin and possible seawater intrusion. These data were again appraised and updated by Toups Corporation in 1976. In 1977, 1994, and 1996 the Santa Barbara County Water Agency assessed and updated these reports as well as several other related studies.

The RWQCB has further defined the groundwater basin into five sub-units, Orcutt, Santa Maria, Lower Nipomo Mesa, Upper and Lower Guadalupe. The Upper and Lower Guadalupe are defined as the same geographic area with the Upper basin occupying the area within 80 feet of the ground surface.

Figure 2.2B. Santa Maria Valley Groundwater Basin.



Santa Barbara County Water Agency: Santa Barbara County 1999 Groundwater Report.

2.3 Land Use:

Land use in the planning area is diverse. It includes a wide range of recreational uses, farms, cattle ranches, urbanized areas, mines, and industrial sites. The unique climate and topography allows such diverse uses as beach recreation at the Pacific Ocean to winter snow sports in the interior. The marine influence allows for a great variety of crops to be grown year-round in the Santa Maria Valley, and the foothill transition areas is considered ideal for certain specialty crops such as grapes. In the Cuyama Valley high quality fruit and nut products are well adapted to the high desert-like area. Various forms of mining occur throughout the area, the most common of which is oil mining. Almost all of the private land that is not devoted to other uses is used for beef cattle ranching. Cattle grazing allotments are also permitted on federally managed public lands where there are suitable sites.

Farming is the single most important industry in the watershed relative to its effects on the economy, culture, and the environment. It is also the largest user of the water resources. It a diverse industry with the ability to produce virtually any crop, and unique in that it is one of the few regions in the country with the ability to grow crops year-round in the coastal area.

The vast majority the cropland is irrigated under a variety of conditions ranging from precision leveled land with deep fertile soils and few limitations to relatively steep uplands with a limited soil base. With increasing slopes, special management practices are required to ensure the long-term viability of the resource. Almost all of the water in support of agriculture is pumped from groundwater resources, except for rangeland where some surface water is consumed by livestock.

Table 2.3A lists all of the land uses in the project area. Table 2.3B provides similar information, but it segregates the land use by county. The basis of this inventory is a survey completed by the CA Department of Water Resources (DWR). That survey was last updated by the DWR in 1995. The background maps used for the inventory were USGS 7.5-minute quadrangles (1:24,000 scale). Forty-nine quadrangles are required to completely cover the planning area. Because of the volume, the detailed land use maps are not included with this text. Copies of the disk can be obtained from the DWR. Each disk contains land use for an entire county. Targeted regions, such as the Santa Maria River watershed, must be segregated from the total database. To retrieve the information Autocad, or some sort of GIS based software is required.

Because of the extensive agricultural expansion in recent years the RCD updated the mapping to the year 2000 using ground surveys. However, the RCD update does not list all of the attributes included in the DWR survey. That survey is extremely detailed, and beyond the need of this project.

For the purposes of this project the following interpretations were made relative to land use:

(1) The DWR survey included all annual crops rotations on farmed land. For the purposes of this project, the primary crop was used as a determining factor to determine land use. For example, In Cuyama Valley temperature inversions limit the growing season and crop selection. A common practice is to grow an irrigated vegetable crop during the warm season then rotate to a non-irrigated

winter grain crop. (Some supplemental irrigation may be used for the grain, but it is usually a minimal amount.) Under these conditions, the irrigated crop took precedence as the primary land use, and only one irrigated vegetable crop was assumed to be produced each year. The non-irrigated crop is not included in the summary table.

(2) For the purposes of this project, all of the crops that are coded as “T” on the DWR disk are called “Annual Crops”. (The “T” category includes all vegetables, flowers, and berries.) In addition, this project includes turf farms as annual crops. They are coded as “Pasture” in the DWR file.

In Santa Maria Valley, it was assumed that each acre listed as an “Annual Crop” was farmed year-round. Most of the growers in this region produce two or more crops per acre each year. The DWR survey also listed strawberries and flowers as truck crops. They are also included as such in this project.

(3) The DWR survey is not always consistent with crop categories that are traditionally used locally, including the Agricultural Commissioner’s annual crop reports. For example, the DWR report lists all cereal grains as “Grain and Hay Crops”, safflower, corn, Sudan, and beans as “Field Crops”, and alfalfa is included with turf farms and grazed irrigated pastures under the category “Pasture”.

For the purposes of this project, all areas used to grow cereal grains, Sudan grass, safflower, and beans are listed as “Dryland Farming” acknowledging that in some cases supplemental irrigation may be applied.

Table 2.3A: Land Use Summary (acres – Year 2000)

Land Use	[1] Santa Maria Valley	[2] Cuyama Valley	Other Regions	Totals
(I) Annual	46,962	19,040	81	66,083
(I) Subtropical	1,572	0	0	1,572
(I) Vineyards	6,995	2,231	135	9,361
(I) Deciduous	154	3,134	0	3,288
(I) hay or pasture	1,399	3,670	49	5,118
Total irrigated	57,082	28,075	265	85,422
Dry farmed	5,860	1,208	515	7,583
Total farmed	62,942	29,283	780	93,005
[3] Urban	20,222	345	101	20,668
[4] Landscape	333	20	20	373
Ag support	528	400	5	933

Land Use	[1] Santa Maria Valley	[2] Cuyama Valley	Other Regions	Totals
[5] Mined	8,562	8,600	65	17,227
Total urban/mined	29,645	9,365	191	39,201
[6] Other private	-	-	-	366,624
[7] USDI - BLM	-	-	-	62,040
[7] USDA - USFS	-	-	-	634,900
Total other land	-	-	-	1,063,564
Total land project				**1,195,770**

1] Includes Nipomo Mesa area that is within the drainage basin of the Santa Maria River.

2] Includes upstream areas to Ozena Valley.

3] Includes households, ranchettes, commercial and industrial

4] Includes parks, green belts, and golf courses.

5] Mining is the dominant use. May have other uses such as grazing livestock

6] Most of this land is used for grazing; however, this category also includes surface waters sand dunes and similar land forms that are not suitable for grazing.

7] All of these areas are used for outdoor recreation. Other land uses are allowed under special permits from the management agency. Approximately 277,000 acres have been designated as “wilderness”. This land use generally restricts access to foot or horseback.

Table 2.3B: Land Use by County (Acres – Year 2000)

Land Use	Santa Barbara	San Luis Obispo	Ventura	Kern
(I) Annual	47,925	17,489	669	0
(I) Subtropical	0	1,572	0	0
(I) Vineyards	6,801	2,540	20	0
(I) Deciduous	49	3,096	143	0
(I) Hay	2,623	1,699	796	0
Total Irrigated	57,398	26,396	1,628	0
Dry farmed	2,601	4,520	462	0
Total farmed	59,999	30,916	2,090	0
Urban	17,256	3,377	35	0
Urban landscape	343	30	0	0
Ag. Support	731	95	107	0
Mined	16,074	1,153	0	0
Total urban/mined	34,404	4,655	142	0
Other private	269,917	83,107	12,000	1,600
USDI-BLM	7,100	54,600	80	260
USDA-USFS	374,400	90,300	160,000	10,200
Total other land	651,417	228,007	172,080	12,060
Total in County	**745,820**	**263,578**	**174,312**	**12,060**

2.3.1 Urban Land-The principal urbanized land in the project area is the City of Santa Maria and the unincorporated area from Orcutt to Santa Maria. Other urbanized communities are Nipomo, Guadalupe, New Cuyama, Garey and Sisquoc. Nipomo and Guadalupe are currently expanding; however, the other communities are static or have very modest growth. Collectively the urbanized communities occupy approximately 21,000 acres and have a population of approximately 100,000.

Some areas in the general vicinity of Santa Maria Valley are zoned for low-density rural housing including, Nipomo Mesa, Suey Canyon, Tepesquet Canyon, and the general area along Telephone Road near Santa Maria. These areas are included as part of the urbanized acreage.

2.3.2 Agriculture (farming)-All of the land in Santa Maria Valley that was naturally flat, or nearly so, has been precision leveled, and for the most part is used to grow a great variety of vegetables on a year-round basis. The surrounding non-forested rolling hills, and some forested mountain transition slopes, have been undergoing a rather rapid transition from rangeland to irrigated crops. The converted non-forested hills are used to grow wine grapes, vegetables, and some specialty crops such as strawberries and flowers. The converted mountain transition areas are used exclusively for growing wine grapes. Almost all of the converted areas were used for grazing beef cattle. There are some plantings of avocados and lemons in the region around Nipomo and lower Suey Creek because of a favorable microclimate. The only major dry-farmed area in the coastal region is along Nipomo Creek and continuing east to include the area north of Highway 166 in San Luis Obispo County.

Except for some relatively small areas in the Alamo Creek and Huasna River drainages, the only other major farming enterprises are in Cuyama Valley. Almost all of the farmed land in Cuyama Valley is in the eastern half because of limited groundwater supplies in the western part of the valley. The farmed land is mostly in San Luis Obispo and Santa Barbara Counties, and extending in a relatively narrow band into Ventura County as far as Ozena Valley. The principal crops are carrots, alfalfa, wine grapes, and various deciduous fruits and nuts. All crops are irrigated except for some winter grain that is sometimes used as a winter rotation crop. The grain is usually dry-farmed. Climate restricts the growing season for irrigated crops from about mid-March to the end of October.

2.3.3 Agriculture (rangeland)-Most of the private land in the project area that is not farmed, or urbanized, is used to graze beef cattle. Grazing is also permitted on public land where there are suitable forage areas. However, there are many large tracts in the public land that are not grazed because of wilderness designations, or because topography and cover types are not suitable for grazing.

2.3.4 Public Land-Approximately 697,000 acres of land in the project area is in public ownership. Most of it (635,000 acres) is located within the Las Padres National Forest (LPNF) and is managed by the USDA-Forest Service (USFS). The exception is the Caliente Mountains that form the northern watershed boundary in the Cuyama area. That area is managed by the USDI-Bureau of Land Management (BLM). The BLM also manages various small parcels scattered throughout the planning area.

Management of the National Forest land within the watershed is in accordance with a general LPNF plan. Two regional offices administer the plan. The Santa Lucia District (SLD), with an office located in Santa Maria, and the Mount Pinos District (MPD) with an office located in Frazier Park. The LPD serves an area that includes the Sisquoc River basin, Huasna River, and Alamo Creek watersheds. They also administer to those public lands in the Cuyama River watershed that drain from south to north, and are west of McPherson Peak. Upstream of McPherson Peak all public lands in the Cuyama River drainage basin, except BLM land, is managed by the MPD. The BLM lands are also managed according to general plan for the Caliente Resource Area that includes an area ranging from the coast to the Sierra Nevada Mountains. The BLM regional office for this watershed is in Bakersfield.

The federal lands are used for a variety of purposes including commercial uses such as grazing, oil/gas and solid mineral extraction, and siting for utility lines and communications antennas. All of the federal land is technically available for recreational activities; however, many of the parcels get limited or non-use because they are inaccessible to the public. Some areas have specific management guidelines that restrict or limit access, or preclude certain activities, because of cultural resource concerns, sensitive species, or critical environments. About 277,000 acres are in designated wilderness areas.

2.3.5 Mined Land- Historically much of the land in the greater Santa Maria area and Cuyama Valley was mined for oil and natural gas. Both areas are in production decline, and many of the wells and support facilities have been abandoned. Some of the abandoned facilities have been, or are in the process, of being removed and the land reclaimed for other uses. In addition to oil mining, the only other active mining enterprises are sand and gravel extraction and a rock quarry. The sand and gravel is mined from the Sisquoc Riverbed near Garey, and the Cuyama River bed near Ventucopa. The rock quarry is located on a private parcel at the head of Colsen Canyon in the Los Padres National Forest. Some gravel mining also took place in Alamo Creek, however, that operation has been terminated. There are several abandoned mines in the watershed including a mercury mine in Stephens Canyon – a tributary to the Huasna River, an abandoned quarry in the Tepesquet area, and an abandoned phosphate mine in Cuyama Valley.

2.4 Topography:

Elevations in the watershed range from sea level to 8,286 feet at Mt. Abel the highest point in the Cuyama River basin. The highest point in the Sisquoc River basin is Big Pine Mountain at 6,828 feet. The land characteristic includes two major valleys, Santa Maria and Cuyama both of which are relatively flat. Santa Maria Valley is bordered by rolling hills that transition abruptly into steep mountains. Elevations range from near sea level to approximately 300 feet. Cuyama Valley is at elevations ranging from approximately 1400 feet on the western end to 3,500 feet in the east. The Cuyama Valley is bordered by the Sierra Madre Mountains on the south and the Caliente Mountains on the north. Both ranges are joined on the eastern and western ends by transverse ridges. The transition to the rugged Caliente Mountains is abrupt; whereas, there is a more gentle transition through rolling hills into the Sierra Madre range.

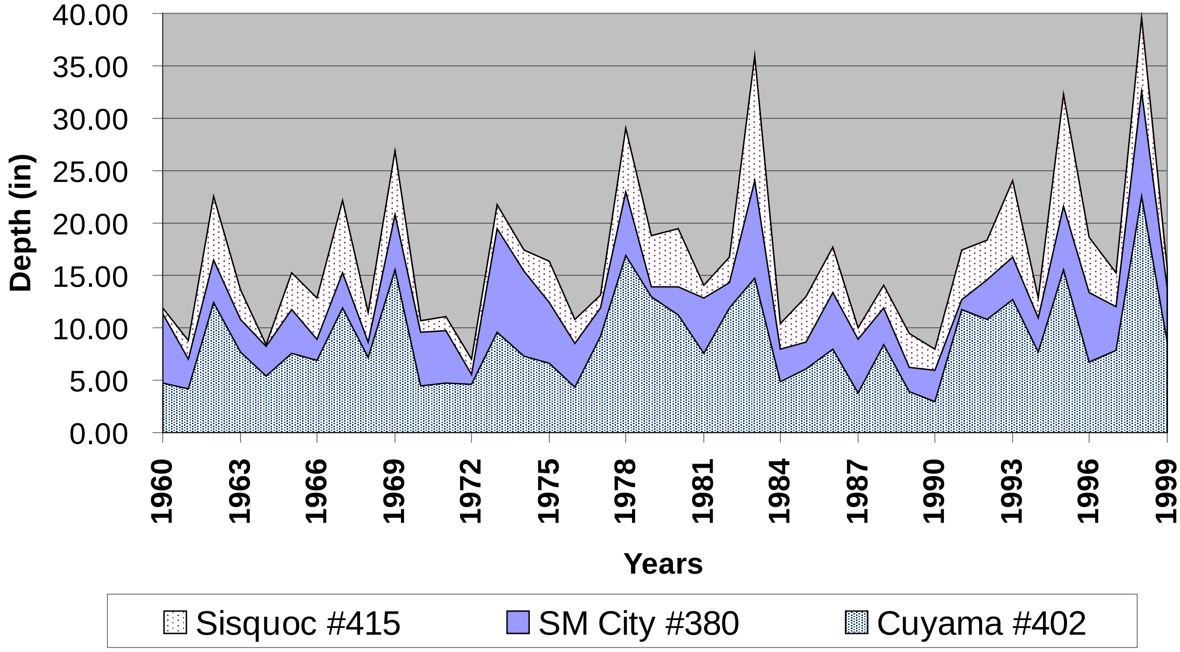
2.5 Climate:

Precipitation varies considerably throughout the project area with average annual rates ranging from 6 inches in Cuyama valley to approximately 40 inches in the interior mountains; however, extreme variances are relatively common. The average annual rainfall in the coastal low lands is about 12-14 inches; however, the precipitation increases rapidly as elevations increase. In contrast to this general precipitation pattern is the Cuyama Valley. Although the valley is several thousand feet higher than the coastal region, it receives considerably less rainfall because it is surrounded by mountains that capture most of the storm intensities. Most of the precipitation in the form of rainfall, but significant snowfall is common in the mountains. Almost all of the precipitation is received between October and April, except in the Cuyama region where summer thunderstorms are sometimes significant. Table 2.6 illustrates the annual total rainfall. The rain year is from July 1 to June 30.

Figure 2.5 on the page following is a graphical illustration of the annual rainfall for the last 50 years at the gauging stations in Santa Maria, Sisquoc, and Cuyama.

Temperatures in the general vicinity of Santa Maria Valley are relatively mild because of the moderating influence of the Pacific Ocean. Ground fog is common, particularly during the summer months. Although most of this area is not frost free, temperatures below freezing are generally for relatively short periods. The climate in the Cuyama Valley region is somewhat similar to the Mojave Desert with hot dry summers, and cool winters. Winter temperatures at, or below, freezing are common with occasional inversions to 10^{o} F. Conversely, summer temperatures in excess of 100^{o}F are common. Freezing temperatures are common throughout the winter in all of the mountainous regions.

Figure 2.5. Historic Annual Precipitation at Sisquoc, Santa Maria and Cuyama Stations.



2.6 Stream Flow Records:

The following Tables illustrate peak flows at the Cuyama River Buckhorn gage, and the Sisquoc River Garey gage. Although runoff is more dependent on storm intensity and duration than annual rainfall accumulation, there is a strong correlation, and in general the peak flows are closely associated with the rainfall year.

Table 2.6A. Stream Measurements – Cuyama River.

Peak Discharge Cuyama River @ Buckhorn Gage (S.B.Co. Water Agency)			
DATE	YEAR	DISCHARGE (cfs)	STAGE (ft)
03/12	1904	220	0.00
03/13	1905	10000	0.00
02/10	1960	30	0.00
11/07	1961	249	5.24
02/11	1962	8730	10.85
02/14	1963	8	3.43
01/21	1964	1	3.14
04/10	1965	84	4.19
12/30	1966	2170	6.90
12/06	1967	9680	11.26
11/22	1968	226	5.08
02/25	1969	17800	13.70
03/01	1970	370	4.82
11/29	1971	1510	6.92
12/26	1972	210	5.43
02/11	1973	4000	9.10
01/07	1974	124	6.45
03/08	1975	748	7.32
09/30	1976	984	7.68
01/03	1977	214	7.07
03/04	1978	15700	14.74

Peak Discharge Cuyama River @ Buckhorn Gage (S.B.Co. Water Agency)			
DATE	YEAR	DISCHARGE (cfs)	STAGE (ft)
03/28	1979	726	7.58
02/19	1980	3130	8.97
03/05	1981	163	7.27
04/12	1982	2640	8.37
03/01	1983	13300	12.66
12/25	1984	1400	7.84
12/19	1985	112	6.73
02/15	1986	3010	8.98
06/08	1987	953	7.85
11/05	1988	472	7.46
02/11	1989	159	7.02
09/23	1990	2550	9.28
03/19	1991	10100	1.77
02/12	1992	8760	11.35
02/19	1993	9020	11.65
02/20	1994	37	6.39
03/11	1995	1400	0.00
02/20	1996	2730	0.00
01/26	1997	1810	0.00
02/23	1998	26200	15.50

Table 2.6B. Stream Measurements – Sisquoc River.

Peak Discharge Sisquoc River @ Garey Station (S.B.Co. Water Agency)			
DATE	YEAR	DISCHARGE (cfs)	STAGE (ft)
03/05	1941	7000	7.70
04/22	1942	875	4.85
01/23	1943	13000	8.46
02/22	1944	6600	6.43
02/02	1945	5400	6.25
03/30	1946	4000	5.87
11/23	1947	900	4.76
----	1948	0	----
03/11	1949	50	3.48
02/06	1950	900	4.56
----	1951	0	----
01/15	1952	8910	7.46
01/14	1953	480	3.00
02/17	1955	137	4.22
01/27	1956	2120	6.19
10/19	1957	105	4.08
04/03	1958	8000	9.60
02/11	1959	1000	5.44
01/12	1960	4	4.67
----	1961	0	----
02/10	1962	7200	7.80
02/10	1963	150	----
----	1964	0	----
04/10	1965	900	5.75
12/29	1966	1370	6.10
12/06	1967	22600	13.50
03/08	1968	2280	7.47
01/25	1969	24500	13.00
03/01	1970	1000	8.95

Peak Discharge Sisquoc River @ Garey Station (S.B.Co. Water Agency)			
DATE	YEAR	DISCHARGE (cfs)	STAGE (ft)
11/29	1971	1910	7.56
12/27	1972	748	5.55
02/11	1973	10400	10.22
01/07	1974	988	5.99
03/08	1975	2170	6.61
02/10	1976	389	4.73
01/06	1977	72	3.84
03/04	1978	22200	10.67
03/28	1979	2490	6.65
02/19	1980	7980	7.80
03/05	1981	3560	7.09
04/11	1982	3400	7.47
03/01	1983	33600	11.16
12/25	1984	2300	6.14
----	1985	----	----
02/15	1986	3860	6.15
----	1987	0	----
02/29	1988	2790	----
----	1989	0	----
----	1990	0	----
03/19	1991	7250	8.31
02/12	1992	8550	8.51
02/23	1993	9520	7.87
02/08	1994	1060	6.58
03/11	1995	15600	----
02/20	1996	7400	----
12/22	1997	3060	----
02/03	1998	29500	----

2.7 Geology:

Geologic formations are described in various U.S. Geological Survey (USGS) publications. Approximately 50 percent of the watershed has been updated and published by the Dibblee Geological Foundation. The basis for the Foundation maps is USGS 7.5 minute quadrangles. Due to the size of the watershed, no attempt was made to describe the geologic formations in this project narrative.

2.8 Soils:

A detailed description of the soils on private land in the drainage basin is contained in two NRCS documents; “Soil Survey of Northern Santa Barbara Area, CA” and “Soil Survey of San Luis Obispo County, CA – Coastal Part”. Most of the project area is contained in the Santa Barbara County survey, including the private lands in Cuyama Valley that are within San Luis Obispo

County. That survey is out of print and not available for distribution. However, site specific photocopies of the text and associated maps are available at the NRCS Santa Maria office. The San Luis Obispo County survey describes the soils on private land in the north to south draining tributaries that are in San Luis Obispo County other than Cuyama Valley. Copies of the survey are available from the NRCS offices in Santa Maria or Templeton.

The soils on public land are mapped in much less detail than the private land surveys. These surveys are available for reference only from the respective land management agencies.

Almost all of the soils are derived from ancient sedimentary deposits. They include a great variety of textures ranging from dune sand to dense clay. Most of the valley soils are light texture soils that are well drained; however, there are some exceptions where clay lenses inhibit drainage. In the west-end of Santa Maria Valley, there are perched high water tables; however most of those areas have been artificially drained with underground tiles.

In general, the transition areas to uplands have the same variety of soil textures. However, as slopes increase the soil depths decrease because of historic erosion. In the steepest areas, the parent geologic material is exposed, and for all practical purposes, there is no soil. The upland soils of Nipomo Mesa, and the general area around Orcutt, are somewhat unusual because they are derived from wind blown deposits and are generally pure sand.

2.9 Natural Habitat Types:

This watershed because of its diversified topography and complex distribution of soils and precipitation often results in abrupt changes in plant communities, or parts of one community occurring as an island within another. For example, a north-facing slope may be dominated by oak woodland, whereas the south slope may be chaparral. Or, the community may be dissected at its margins with parts of one dovetailing into the other. A great variety of plant species occur, ranging from low prostrate succulent plants on the coast to montane coniferous forests at the highest inland elevations. Many plant species with widespread distribution occupy a number of climatic zones and have a corresponding number of races or ecotypes each fitting into its environmental niche.

The following habitat descriptions were abstracted from a composite of botany texts, Including "A California Flora" (Munz 1973), "A Flora of the Santa Barbara Region, California" (Smith 1976), "The Vascular Plants of San Luis Obispo County, California, (Hoover 1970). Many of these habitats have been compromised by introduced plant species. Some habitats, such as the Valley grasslands, are dominated by introduced annual species.

COASTAL STRAND: Sandy beaches and dunes scattered along the coast. Annual rainfall of 15 inches or less with much wind and fog. The growing season is year round and almost frost free. There are small seasonal and diurnal fluctuations in temperature. Vegetation is low and often succulent. Dominant native plant species include members of the genera *Atriplex, Abronia, Carpobrotus, Franseria, and Oenothera.* Some of the dunes are dominated by introduced European beach grass.

COASTAL SALT MARSH: Salt marsh along the coast, from sea level up to 10 feet. This habitat is exclusive to the Santa Maria River estuary. Dominant plant species include members of the genera *Salicornia, Distichlis, Frankenia, and Suaeda.*

COASTAL SAND PLAINS AND STABILIZED DUNES: Located just inland from the coastal strand and not sharply distinguished from it. Many of the plant species thrive on both stable and drifting sand areas. Dominant native plant species include members of the genera *Lupinus, Eriogonum, Amsinckia, Corethogune, and Salvia.* Many of the stable dunes are dominated by introduced African veldt grass.

FRESHWATER MARSH: This habitat is primarily represented in this watershed by the Dune Lakes, Betteravia lakes, and Bradley Lake. The climate is similar to the Coastal Strand environment. Dominant plant species include members of the genera *Typha, Sparganium, and Scirpus.*

COASTAL SAGE SCRUB: This is an association of soft woody plants generally found on dry rocky or gravelly slopes below 3000 feet elevation. The average rainfall is between 10 and 20 inches, and frost is common during the winter months. Dominant plan species are *Artemesia californica, Salvia spp., and Baccaharis pilularis.*

CHAPARRAL: Chaparral is a catch-all term for closely growing woody plants that are common at the higher elevations and rainfall areas throughout the planning area. In transition areas, the hard woody plants are found in association with the softer coastal sage scrub. Dominant plant species include members of the genera *Adenostoma, Ceanothus, Arctostaphylos, Quercus, and Eriodictyon.*

COASTAL GRASSLANDS: Coastal grasslands are poorly represented by native plant species. For all practical purpose the native perennial grassland plants have been displace by introduced annuals. Historically the native plants were bunch grasses mostly of the genus *Stipa*. During the last century, they have largely been displaced by annuals species dominated by the genera *Bromus, Festuca, and Avena*.

SALINE/ALKALINE PLAINS: This habitat is found only in the Cuyama Valley. The average annual rainfall is 6 to 9 inches. The dominant plants are various species

of *Atriplex,* and an introduced annual grass *Bromus ruebens*. There are few trees except for junipers at the higher elevations, and a few remnant cottonwood groves near the Cuyama River.
OAK WOODLANDS: Oak woodlands are common throughout the foothill regions in the watershed. These habitats are dominated by *Quercus* species. In some places, there is a closed canopy with minimal understory development. In areas with understory development, the dominant plants are the same introduced annual grasses found in the Coastal grasslands.

PINYON-JUNIPER WOODLAND: This plant association is found in the eastern part of Cuyama Valley at intermediate to high elevations from about Ventucopa to the top of the watershed. The dominant plants are *Pinus monophylla and Juniperus californica.*

MONTANE CONIFEROUS FOREST: This habitat is found primarily at the highest elevations and rainfall areas in the extreme eastern part of the watershed. There are; however, remnant communities found throughout the Sierra Madre Mountain range. There are various *Pinus* species, some of which were planted in the early part of this century and are apparently not native to the area.

RIPARIAN WOODLAND: Riparian woodlands are common throughout. The dominant species usually of the genera *Salix, Baccahris, Quecus, and Populus.*

2.10 Sensitive Species and Habitats:

Table 2.10 lists sensitive species presumed to occur in the Santa Maria River watershed. This list was taken from the California Department of Fish and Game (F & G) “Natural Diversity Data Base” dated 12/01/99. Thirty-two species have a formal designation of sensitivity. This designation was made by the U. S. Fish and Wildlife Service (FWS), and/or the F & G. Twenty-three other species have been identified as species of special concern by one or both of the agencies. Presumably, at least part of these special concern species will be added to the list in the future.

The database also lists a variety of habitats in this watershed as sensitive; however, there are no special habitat status designations assigned to define the degree of sensitivity.

Table 2.10 - Sensitive Species of the Santa Maria River Watershed

	Common Name	Scientific Name	Status 1] Fed/State	Habitat
PLANTS	Beach Layia	*Layia carnosa*	FE/SE	Coastal dunes
	Beach Spectaclepod	*Dithyrea maritima*	FSC/ST	Coastal dunes
	Black-flowered Figwort	*Scrophularia atrata*	FSC/None	Coastal sage scrub
	Blochman's Dudlea	*Dudlea blochmaniae ssp. Blochmania*	FSC/None	Open fields, coastal
	California Seablite	*Suaeda californica*	FE/None	Coastal marsh
	Crisp Monardella	*Monardella crispa*	FSC/None	Coastal dunes
	Dune Larkspur	*Delphinium parryi ssp. Blochmania*	FSC/None	Coastal dunes
	Flax-like Monardella	*Monardella linoides ssp. Oblonga*	FSC/None	Mountains vicinity of Mount Abel
	Fort Tejon Woolly Sunflower	*Erophyllum lanatum var. hallii*	FSC/None	Sierra Madre Mtns. Above 4600 feet
	Gambel's Water Cress	*Rorippa gambelii*	FE/ST	Stream & marshes below 1250 meters
	Hoover's eriastrum	*Eriastrum hooveri*	FT/None	Sandy field SE New Cuyama
	Kellogg's Horkelia	*Horkelia cuneata ssp. Sericea*	FSC/None	Coastal woodland
	La Graciosa Thistle	*Cirsium loncholepis*	FPE/ST	Marshy areas estuary & Oso Flaco Lake
	Nipomo Mesa Lupine	*Lupinus nipomensis*	FPE/SE	Nipomo mesa
	Pale-yellow Layia	*Layia heterotricha*	FSC/None	Cuyama Valley
	Palmer's Mariposa Lily	*Calochortus palmeri var. palmeri*	FSC/None	Moist areas in mountains
	Parish's Checkerbloom	*Sidalchea hickmanii ssp. Parashii*	FC/SR	Disturbed areas Sierra Madre ridge
	San Luis Obispo County Lupine	*Lupinus ludovicianus*	FSC/None	Dry places below 1500 feet-coastal
	San Luis Obispo County Monardella	*Monardella frutescens*	FSC/None	Sandy fields coastal
	Sand Mesa Manazanita	*Arctostaohylos rudis*	FSC/None	Nipomo Mesa
	Santa Ynez False Lupine	*Thermopsis macrop[hylla*	FSC/SR	Scattered in coniferous forests
	Seaside Bird's-beak	*Cordylanthus rigidus ssp. Littoralis*	FSC/SE	Coastal dunes
	Surf Thistle	*Cirsium rhothophilum*	FSC/ST	Coastal dunes
MAMMALS	American Badger	*Taxidea taxus*	None/SSC	Sandy to loamy soils
	Giant Kangaroo Rat	*Dipodomys ingens*	FE/SE	Cuyama Valley
	Pallid Bat	*Antrozous pallidus*	None/SSC	Throughout basin
	San Joaquin Antelope Squirrel	*Ammospermophilus nelsoni*	FSC/ST	Cuyama Valley
	San Joaquin Kit Fox	*Vulpes macrotis mutica*	FE/ST	Cuyama Valley
	San Joaquin Pocket Mouse	*Perognathus inornatus inornatus*	FSC/None	Cuyama Valley
	Southern Sea Otter	*Enhydra lutris nereis*	FT/None	Ocean
BIRDS	American Perigrine Falcon	*Falco peregrinus anatum*	FE/SE	Throughout basin
	Brown Pelican	*Pelecanus occidentalis*	FE/SE	Ocean and estuary
	California Condor	*Gymnogyps californianus*	FE/SE	Sierra Madre mts.
	California Least Tern	*Sterna antillarum browni*	FE/SE	Ocean and estuary

	Common Name	Scientific Name	Status 1] Fed/State	Habitat
	Least Bell's Vireo	*Vireo bellii pusillus*	FE/SE	Riparian areas
	Swainson's Hawk	*Buteo swainsoni*	None/ST	Foothills & mountains
	Cooper's Hawk	*Accipiter cooperii*	None/SSC	Foothills & mountains
	Tri-colored Blackbird	*Agelaius tricolor*	FSC/SSC	Marshes
	Western Snowy Plover	*Charadrius alexandrinus nivosus*	FT/SSC	Beaches
	Willow Flycatcher	*Empidonax traillii*	FE/SE	Riparian willlows
	California Black Rail	*Laterallus jamaicensis coturniculus*	FSC/ST	Marshes
	California Clapper Rail	*Rallus longirostris obsoletus*	FSC/ST	Salt marsh
AMPHIBIANS	Arroyo Toad	*Bufo microscaphus californicus*	FE/SSC	Seasonal pools
	California Red-legged Frog	*Rana aurora draytonii*	FT/SSC	Riparian with slow moving streams
	California Tiger Salamander	*Ambystoma californiense*	FE/SSC	Seasonal pools and associated uplands
	Western Spadefoot	*Scaphiopus hammondii*	FSC/SSC	Seasonal pools
REPTILES	Blunt-nosed Leopard Lizard	*Gambelia silus*	FE/SSC	Cuyama Valley
	Southwestern Pond Turtle	*Clemmys marmorata pallida*	FSC/SSC	Slow moving water
	Black Legless Lizard	*Anniella pulchra nigra*	FPE/ SSC	Sandy soil sparse vegetation
	California Horned Lizard	*Phrynosoma coronatum frontale*	FSC/SSC	Dry uplands
	Two-striped Garter Snake	*Thamnophis hammondii*	FSC/SSC	Aquatic
FISH	Southern Steelhead	*Oncorhynchus mykiss irideus*	FE/SSC	Rivers
	Tidewater Goby	*Eucyclogobius newberryi*	FE/SSC	Estuary
INVERTE-BRATES	White Sand Bear Scarab Beetle	*Lichnanthe albipilosa*	FSC/None	Coastal dunes

1] FE = Federal endangered; FT = Federal threatened; FPE = Federal proposed endangered; FSC = Federal species of concern; SE = State endangered; ST = State threatened; SR = State rare; SSC = CA Fish & Game Species of concern

NOTE: The SSC listings have not been formally approved by the State legislature.

2.11 Cultural Development and Historical Water Use:

Santa Maria Valley-The first settlers in the area were the Spanish in about 1840. They occupied numerous land grants the largest of which were Ranchos Guadalupe, Nipomo, Punta de la Laguna, Tepesquet, and Sisquoc. These early settlers mostly raised beef cattle, but suffered severe financial losses because of a prolonged drought in the 1860's. American pioneers arrived about 1865, purchased most of the land that was in the old rancho grants, and started farming, principally grain without irrigation, in the general Santa Maria area about 1867. Various fruits and beans were introduced soon thereafter. Most of the crops were exported by boat from Point Sal, or by narrow gage railroad to Port Harford near the town of Avila until 1901 when the Southern Pacific Railroad was completed. Following the 1860's drought cattle ranching again became an important industry, which has continued to the present era where favorable conditions exist.

Union Sugar Company introduced irrigated farming to the area in 1897 to raise sugar beets. The original conveyance system was a gravity flow diversion from the Sisquoc River; however, the system was destroyed by floodwaters several years later. By the 1920's cropping pattern shifted from grain and beans to vegetables-a pattern that exists to the present era. All of the crops were, and currently are, irrigated from pumped groundwater resources using a variety of surface and pressurized water conveyance systems. At the same time that irrigated cropland was increasing there were numerous small dairies being developed. Through the years, many went out of the business, or consolidated-a trend that continued until the 1970's when most of the dairies responded to a government buyout program. Today only dairies two exist in the watershed, one is located near Cuyama and one near Sisquoc. The only other animal confinement facilities were beef cattle feed lots in the Santa Maria area. Both have also gone out of business.

In the latter part of the century, there has been substantial expansion of irrigated agriculture. The first major expansion was the introduction of avocados and lemons in the greater Nipomo area in the 1970's. This was followed by a substantial increase in strawberry plantings during the 1980's, and an expanding wine grape industry in the 1990's. In recent years, there has also been significant growth in vegetable production in the upland areas between Santa Maria and the Garey/Sisquoc region. Almost all of the agricultural growth has been in areas that were primarily used as range for beef cattle.

Paralleling the agricultural growth has been a significant build out of both residential, industrial, and retail business facilities in the Santa Maria and Guadalupe areas, all of which have increased the water demand. Some of the M & I demand on groundwater resources has been offset by the importation of water from the state water project.

Cuyama Valley-Most of the agricultural development in Cuyama Valley did not occur until well into this century. Originally, the greater part of the area was within two large ranches. They have since been sub-divided. Prior to 1939 there were only about 400 irrigated acres, and the only other agricultural enterprises were raising beef cattle and some dryland grain production. With the start of World War II irrigated farming increased rapidly to about 5,000 acres by the end of the war. Electricity was introduced into the areas about that time and with this source of energy, irrigated farming rapidly increased to the extent of groundwater availability. (Groundwater resources are limited primarily to the eastern end of the valley because of the geologic formations that restrict groundwater movement.) Historically the primary crop was alfalfa hay, with various root crops used as an alternative in the rotation plan. In the mid 1980's there was a rapid change into carrot production, and more recently there have been substantial planting of deciduous fruits, nuts, and wine grapes. Alfalfa hay production now makes up less than 25 percent of the planted areas.

All of the water used for agricultural irrigation in Cuyama Valley is pumped from groundwater resources. For all practical purposes, most of the consumptive water use is by agriculture. The total permanent population in the area is less than one thousand, and the only other major industry, oil mining, is on the decline.

Section 3. WATER QUALITY OBJECTIVES

3.1 Nonpoint Source Regulatory Authorities:

The Central Coast Regional Water Quality Control Board (RWQCB) is responsible for administering regulations established by the Federal Clean Water Act (CWA) and the California Water Code (Porter-Cologne Water Quality Control Act). Polluted runoff is also addressed under Section 6217(a) of the Coastal Zone Act Reauthorization amendments of 1990 (CZARA). Oversight of the RWQCB is provided by the State Water Resources Control Board (SWRCB).

The CWA is the principal federal authority for water quality protection. It became law in 1972. At that time, it principally addressed point sources of water pollution. In 1987, Congress amended the act to require states to address NPS problems. That amendment requires that states adopt water quality standards to correct NPS pollution, and submit those standards to the U.S. Environmental Protection Agency (EPA) for approval. In compliance with that statute, the state has prepared a plan entitled **"**California's Nonpoint Source Pollution Control Program" (July 2, 1999). This plan has a goal to improve water quality in affected water bodies by 2013. The plan requires that the State implement appropriate measures to reduce NPS sources of pollution using a three- tiered approach, with Tier 1 being the preferred method.

Tier 1: Voluntary implementation of Best Management Practices (BMPs) - This allows landowners flexibility and self-determination in deciding which practices are most appropriate for their situation.

Tier 2: Regulatory based encouragement to ensure implementation of BMPs -. This tier allows the RWQCB two ways to use their regulatory authority. The RWQCB may waive adoption of waste discharge requirements on conditions that ensure BMPs are implemented, or they may provide direct enforcement by entering into agreements with other agencies that have authority to enforce the implementation of management practices.

Tier 3: Enforcement- This tier allows the RWQCB to adopt and enforce requirements that reduce pollution from waste discharges, including discharges from nonpoint sources.

The California Water Code, commonly referred to as the Porter-Cologne Act, is the principal state law governing water quality regulation in California. It establishes a comprehensive program to protect water quality and the beneficial uses of water. It also established the RWQCBs and the SWRCB. Many of the provisions of the CWA are incorporated into this law. Porter-Cologne requires that RWQCBs describe the beneficial uses of each of the regional water bodies, and to determine water quality standards that must be maintained to allow those uses. The act also requires the RWQCB to prescribe actions that are necessary to achieve the water quality objectives.

The Coastal Zone Management Act of 1972 was amended by Congress in 1990 to specifically address water quality. This act (CZARA) principally focuses on nonpoint pollution problems as they relate to the protection of coastal waters. It requires state agencies to coordinate efforts to develop and implement management measures to achieve water quality objectives in the coastal environment.

3.2 Beneficial Uses:

State policy for water quality control is directed toward achieving the highest water quality to provide maximum benefit to the people of the state. Establishing beneficial uses to be protected is the cornerstone of the Central Coast Region Water Quality Control Plan (Sept. 1994). Based on these uses, standards and levels of treatment to achieve these standards can be established.

Beneficial uses of water are divided into 24 categories. Five of these categories do not apply to this watershed. The applicable categories are defined as follows:

Municipal and Domestic Supply (MUN) - Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply. According to State Board Resolution No.88-63, "Sources of Drinking Water Policy", all surface waters are considered suitable, or potentially suitable, for municipal or domestic water supply except where:

a. TDS exceeds 3000 mg/l (5000 uS/cm electrical conductivity);
b. Contamination exists that cannot reasonably be treated for domestic use;
c. The source is not sufficient to supply an average sustained yield of 200 gallons per day;
d. The water is in collection or treatment systems of municipal or industrial wastewaters, process waters, mining wastewaters, or storm water runoff; and
e. The water is in systems for conveying or holding agricultural drainage waters.

Agricultural Supply (AGR) - Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

Industrial Process Supply (PROC) - Uses of water for industrial activities that depend primarily on water quality (i.e., waters used for manufacturing, food processing, etc.).

Industrial Service Supplv (IND) - Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well repressurization.

Ground Water Recharge (GWR) - Uses of water for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers. Ground water recharge includes recharge of surface water underflow.

Freshwater Replenishment (FRSH) - Uses of water for natural or artificial maintenance of surface water quantity or quality (e.g., salinity) which includes a water body that supplies water to a different type of water body, such as streams that supply reservoirs and lakes, or estuaries; or reservoirs and lakes that supply streams. This includes only immediate upstream water bodies and not their tributaries.

Navigation (NAV) - Uses of water for shipping, travel, or other transportation by private, military, or commercial vessels. This Board interprets NAV as, "Any stream, lake, arm of the sea, or other natural body of water that is actually navigable and that, by itself, or by its connections with other waters, for a period long enough to be of commercial value, is of sufficient capacity to float watercraft for the purposes of commerce, trade, transportation, and including pleasure; or any waters that have been declared navigable by the Congress of the United States" and/or the California State Lands Commission.

Water Contact Recreation (REC-1) - Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.

Non-Contact Water Recreation (REC-2) - Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beach combing, camping, boating tide pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

Commercial and Sport Fishing (COMM) - Uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes.

Warm Fresh Water Habitat (WARM) - Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Cold Fresh Water Habitat (COLD) - Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates.

Estuarine Habitat (EST) - Uses of water that support estuarine ecosystems including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds). An estuary is generally described as a semi-enclosed body of water having a free connection with the open sea, at least part of the year, and within which the seawater is diluted at least seasonally with fresh water drained from the land. Included are water bodies, which would naturally fit the definition if not controlled by tide gates or other such devices.

Marine Habitat (MAR) - Uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).

Wildlife Habitat (WILD) - Uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

Rare, Threatened, or Endangered Species (RARE) -Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened, or endangered.

Migration of Aquatic Organisms (MIGR) - Uses of water that support habitats necessary for migration or other temporary activities by aquatic organisms, such as anadromous fish.

Spawning. Reproduction. and/or Early Development (SPWN) - Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

Shellfish Harvesting (SHELL) - Uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g., clams, oysters, and mussels) for human consumption, commercial, or sport purposes. This includes waters that have in the past, or may in the future, contain significant shellfisheries.

Table 3.2 describes beneficial uses for surface waters. Surface waters that are not listed in the table have been assigned designations as (1) Municipal and domestic water supply and (2) Protection as both recreation and aquatic life.

Table 3.2. Beneficial Uses – Surface Waters [1]

[1] RWQCB Water Quality Control Plan, September 1994

Waterbody Names	MUN	AGR	PRO	IND	GWR	REC1	REC2	WILD	COLD	WARM	MIGR	SPWN	BIOL	RARE	EST	FRESH	NAV	POW	COMM	AQUA	SAL	SHELL
SANTA MARIA HYDROLOGIC UNIT																						
Oso Flaco Lake					X	X	X	X		X		X	X	X			X		X			
Oso Flaco Creek	X	X			X	X	X	X		X			X	X		X			X			
Santa Maria River Estuary					X	X	X	X		X	X	X	X	X	X				X			X
Santa Maria River	X	X		X	X	X	X	X	X	X	X			X		X			X			
Corralitos Canyon Creek	X	X				X	X	X											X			
Sisquoc River, downstream	X	X		X	X	X	X	X	X	X	X	X							X			
Sisquoc River, upstream	X				X	X	X	X	X		X	X	X	X					X			
Cuyama River, downstream	X	X			X	X	X	X		X				X					X			
Twitchell Reservoir	X	X			X		X	X		X				X		X			X			
Cuyama River, upstream	X	X	X	X	X	X	X	X	X	X		X		X		X			X			
Alamo Creek	X	X			X	X	X	X	X	X		X		X					X			
Huasna River	X	X			X	X	X	X		X				X					X			
Orcutt Creek	X	X			X	X	X	X	X					X	X	X			X			

3.3 Water Quality General Objectives:

The following general objectives for water quality have been established by the State:

3.3.1 Ocean waters- The provisions of the State Board's "Water Quality Control Plan for Ocean Waters of California" (Ocean Plan), "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California" (Thermal Plan), and any revisions thereto shall apply in their entirety to affected waters of the basin. In addition to provisions of the Ocean Plan and Thermal Plan, the following objectives shall also apply to all ocean waters:

DISSOLVED OXYGEN: The mean annual dissolved oxygen concentration shall not be less than 7.0 mg/I, nor shall the minimum dissolved oxygen concentration be reduced below 5.0 mg/I at any time.

pH:The pH value shall not be depressed below 7.0, nor raised above 8.5.

RADIOACTIVITV: Radionuclides shall not be present in concentrations that are deleterious to human, plant, animal, or aquatic life; or result in the accumulation of radionuclides in the food web to an extent which presents a hazard to human, plant, animal, or aquatic life.

3.3.2 Inland surface waters, enclosed bays, and estuaries:

COLOR: Waters shall be free of coloration that causes nuisance or adversely affects beneficial uses. Coloration attributable to materials of waste origin shall not be greater than 15 units or 10 percent above natural background color, whichever is greater.

TASTES AND ODORS: Waters shall not contain taste or odor-producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, that cause nuisance, or that adversely affect beneficial uses.

FLOATING MATERIAL: Waters shall not contain floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses.

SUSPENDED MATERIAL: Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.

SETTLEABLE MATERIAL: Waters shall not contain settleable material in concentrations that result in deposition of material that causes nuisance or adversely affects beneficial uses.

OIL AND GREASE: Waters shall not contain oils, greases, waxes, or other similar materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect beneficial uses.

BIOSTIMULATORV SUBSTANCES: Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.

SEDIMENT: The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

TURBIDITY: Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increase in turbidity attributable to controllable water quality factors shall not exceed the following limits:

(1) Where natural turbidity is between 0 and 50 Jackson Turbidity Units (JTU), increases shall not exceed 20 percent.
(2) Where natural turbidity is between 50 and 100 JTU, increases shall not exceed 10 JTU.
(3) Where natural turbidity is greater than 100 JTU, increases shall not exceed 10 percent.

Allowable zones of dilution within which higher concentrations will be tolerated will be defined for each discharge in discharge permits.

pH: For waters not mentioned by a specific beneficial use, the pH value shall not be depressed below 7.0 or raised above 8.5.

DISSOLVED OXYGEN: For waters not mentioned by a specific beneficial use, dissolved oxygen concentration shall not be reduced below 5.0 mg/I at any time. Median values should not fall below 85 percent saturation as a result of controllable water quality conditions.

TEMPERATURE: Temperature objectives for Enclosed Bays and Estuaries are as specified in the "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California" including any revisions thereto.

TOXICITY: All waters shall be maintained free of toxic substances in concentrations which are toxic to, or which produce detrimental physiological responses in, human, plant, animal or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, toxicity bio-assays of appropriate duration, or other appropriate methods as specified by the Regional Board.

Survival of aquatic life in surface waters subjected to a waste discharge or other controllable water quality conditions, shall not be less than that for the same water body in areas unaffected by the waste discharge or, when necessary, for other control water that is consistent with the requirements for "experimental water" as described in “Standard Methods for the Examination of Water and Wastewater” latest edition. As a minimum, compliance with this objective shall be evaluated with a 96-hour bioassay.

In addition, effluent limits based upon acute bioassays of effluents will be prescribed where appropriate, additional numerical receiving water objectives for specific toxicants will be established as sufficient data become available, and source control of toxic substances is encouraged.

The discharge of wastes shall not cause concentrations of unionized ammonia (NH_3) to exceed 0.025 mg/l (as N) in receiving waters.

PESTICIDES: No individual pesticide or combination of pesticides shall reach concentrations that adversely affect beneficial uses. There shall be no increase in pesticide concentrations found in bottom sediments or aquatic life.

For waters where existing concentrations are presently nondetectable or where beneficial uses would be impaired by concentrations in excess of nondetectable levels, total identifiable chlorinated hydrocarbon pesticides shall not be present at concentrations detectable within the accuracy of analytical methods prescribed in “Standard Methods for the Examination of Water and Wastewater” latest edition, or other equivalent methods approved by the Executive Officer.

CHEMICAL CONSTITUENTS: Where wastewater effluents are returned to land for irrigation uses, regulatory controls shall be consistent with Title 22 of the California Code of Regulations and other relevant local controls.

OTHER ORGANICS: Waters shall not contain organic substances in concentrations greater than the following:

Methylene Blue (Activated Substances)	0.2 mg/l
Phenols	0.1 mg/l
PCB's	0.3 µg/l
Phthalate Esters	0.002 µg/l

RADIOACTIVITY: Radionuclides shall not be present in concentrations that are deleterious to human, plant, animal, or aquatic life; or result in the accumulation of radionuclides in the food web to an extent which presents a hazard to human, plant, animal, or aquatic life.

3.3.3 Municipal and Domestic supply:

pH: The pH value shall neither be depressed below 6.5 nor raised above 8.3.

ORGANIC CHEMICALS: All inland surface waters, enclosed bays and estuaries shall not contain concentrations of organic chemicals in excess of the limiting concentrations listed in Table 3.3.3A.

Table 3.3.3A. Maximum Organic Contaminant Levels – Domestic or Municipal Supply [1]

	Constituent	Maximum Contaminant Level (MCL), mg/l*
(a)	Chlorinated Hydrocarbons	
	Endrin	0.0002
	Lindane	0.004
	Methoxychlor	0.1
	Toxaphene	0.005
(b)	Chlorophenoxys	
	2,4-D	0.1
	2,4,5-TP Silvex	0.01
(c)	Synthetics	
	Atrazine	0.003
	Bentazon	0.018
	Benzene	0.001
	Carbon Tetrachloride	0.0005
	Carbofuran	0.018
	Chlordane	0.0001
	1,2-Dibromo-3-chloropropane	0.0002
	1,4-Dichlorobenzene	0.005
	1,1-Dichloroethane	0.005
	1,2-Dichloroethane	0.0005
	cis-1,2-Dichloroethylene	0.006
	trans-1,2-Dichloroethylene	0.01
	1,1-Dichloroethylene	0.006
	1,2-Dichloropropane	0.005
	1,3-Dichloropropene	0.0005
	Di(2-ethylhexyl) phthalate	0.004
	Ethylbenzene	0.680
	Ethylene Dibromide	0.00002
	Glyphosate	0.7
	Heptachlor	0.00001
	Heptachlor epoxide	0.00001
	Molinate	0.02
	Monochlorobenzene	0.030
	Simazine	0.010
	1,1,2,2-Tetrachloroethane	0.001
	Tetrachloroethylene	0.005
	Thiobencarb	0.07
	1,1,1-Trichloroethane	0.200
	1,1,2-Trichloroethane	0.032
	Trichloroethylene	0.005
	Trichloroflurommethane	0.15
	1,1,2-Trichloro-1,2,2-Trifluoroethane	1.2
	Vinyl Chloride	0.0005
	*Xylenes	1.750

* MCL is for either a single isomer or the sum of the isomers.

1 RWQCB Water Quality Control Plan, September 1994

CHEMICAL CONSTITUENTS: Waters shall not contain concentrations of chemical constituents in excess of the limits specified in Table 3.3.3B.

Table 3.3.3B. Maximum Inorganic Contaminant Levels - Domestic or Municipal Supply [1]

Constituent	Limiting Concentration mg/l Lower	Optimum	Upper	Maximum Contaminant Level
Temperature °F*	Fluoride			
53.7° and below	0.9	1.2	1.7	2.4
53.8° to 58.3°	0.8	1.1	1.5	2.2
58.4° to 63.8°	0.8	1.0	1.3	2.0
63.9° to 70.6°	0.7	0.9	1.2	1.8
70.7° to 79.2°	0.7	0.8	1.0	1.6
79.3° to 90.5°	0.6	0.7	0.8	1.4
Inorganic Chemicals				Maximum Contaminant Level
Aluminum				1
Arsenic				0.05
Barium				1
Cadmium				0.010
Chromium				0.05
Lead				0.05
Mercury				0.002
Nitrate (as NO_3)				45
Selenium				0.01
Silver				0.05

*Annual Average of Maximum Daily Air Temperature, °F based on temperature data obtained for a minimum of five years.

[1] RWQCB Water Qualtiy Control Plan, September 1994

PHENOL: Waters shall not contain phenol concentrations in excess of 1.0 μg/l.

RADIOACTIVITY: Waters shall not contain concentrations of radionuclides in excess of the limits specified in California Code of Regulations, Title 22, Chapter 1 5.

3.3.4 Agricultural supply:

pH: The pH value shall neither be depressed below 6.5 nor raised above 8.3.

DISSOLVED OXYGEN: Dissolved oxygen concentration shall not be reduced below 2.0 mg/l at any time.

CHEMICAL CONSTITUENTS: Waters shall not contain concentrations of chemical constituents in amounts that adversely affect the agricultural beneficial use. Interpretation of adverse effect shall be as derived from the University of California Agricultural Extension Service guidelines provided in Table 3.3.4A.

Table 3.3.4A. Guidelines for Interpretation of Quality of Water for Irrigation [1]

Problem and Related Constituent	Water Quality Guidelines No Problem	 Increasing Problems	 Severe
Salinity			
EC of irrigation water, mmho/cm	<0.75	0.75 - 3.0	>3.0
Permeability			
EC of irrigation water, mmho/cm	>0.5	<0.5	<0.2
SAR, adjusted	<6.0	6.0 - 9.0	>9.0
Specific ion toxicity from root absorption			
Sodium (evaluate by adjusted SAR)	<3	3.0 - 9.0	>9.0
Chloride			
me/l	<4	4.0 - 10	>10
mg/l	<142	142 - 355	>355
Boron, mg/l	<0.5	0.5 - 2.0	2.0 - 10.0
Specific ion toxicity from foliar absorption*(sprinklers)			
Sodium			
me/l	<3.0	>3.0	--
mg/l	<69	>69	--
Chloride			
me/l	<3.0	>3.0	--
mg/l	<106	>106	--
Miscellaneous			
NH4 - N, mg/l for sensitive crops	<5	5 - 30	>30
NO3 - N, mg/l for sensitive crops	<5	5 - 30	>30
HCO3 (only with overhead sprinklers)			
me/l	<1.5	1.5 - 8.5	>8.5
mg/l	<90	90 - 520	>520
pH	Normal range	6.5 - 8.4	--

1 RWQCB Water Quality Control Plan, September 1994.

In addition, waters used for irrigation and livestock watering shall not exceed concentrations for those chemicals listed in Table 3.3.4A. Salt concentrations for irrigation waters shall be controlled through implementation of the anti-degradation policy to the effect that mineral constituents of currently or potentially usable waters shall not be increased. It is emphasized that no controllable water quality factor shall degrade the quality of any ground water resource or adversely affect long-term soil productivity.

Table 3.3.4B. Water Quality Objectives for Agricultural Water Use [1]

ELEMENT	Maximum Concentration (mg/l) Irrigation supply	Livestock watering
Aluminum	5.0	5.0
Arsenic	0.1	0.2
Beryllium	0.1	--
Boron	0.75	5.0
Cadmium	0.01	0.05
Chromium	0.10	1.0
Cobalt	0.05	1.0
Copper	0.2	0.5
Fluoride	1.0	2.0
Iron	5.0	--
Lead	5.0	0.1[a]
Lithium	2.5[b]	--
Manganese	0.2	--
Mercury	--	0.01
Molybdenum	0.01	0.5
Nickel	0.2	--
Nitrate + Nitrite	--	100
Nitrite	--	10
Selenium	0.02	0.05
Vanadium	0.1	0.10
Zinc	2.0	25

a. Lead is accumulative and problems may begin at threshold value (0.05 mg/l).

b. Recommended maximum concentration for irrigation citrus is 0.075 mg/l.

1 RWQCB Water Quality Control Plan, September 1994

Where wastewater effluents are returned to land for irrigation uses, regulatory controls shall be consistent with Title 22 of the California Code of Regulations and with relevant controls for local irrigation sources.

3.3.5 Water Contact Recreation:

pH: The pH value shall neither be depressed below 6.5 nor raised above 8.3.

BACTERIA: Fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200/100 ml, nor shall more than ten percent of total samples during any 30-day period exceed 400/100 ml.

3.3.6 Non-contact Water Recreation:

pH: The pH value shall neither be depressed below 6.5 nor raised above 8.3.

BACTERIA: Fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 2000/100 ml, nor shall more than ten percent of samples collected during any 30-day period exceed 4000/100 ml.

3.3.7 Cold Freshwater Habitat:

pH: The pH value shall not be depressed below 7.0 or raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 in fresh waters.

DISSOLVED OXYGEN: The dissolved oxygen concentration shall not be reduced below 7.0 mg/l at any time.

TEMPERATURE: At no time or place shall the temperature be increased by more than 5^{0}F above natural receiving water temperature.

CHEMICAL CONSTITUENTS: Waters shall not contain concentrations of chemical constituents known to be deleterious to fish or wildlife in excess of the limits listed in Table 3.3.7

Table 3.3.7. Maximum Toxic Metal Concentrations – Aquatic Habitats [1]

	Freshwater (COLD, WARM)	
METAL	HARD (> 100 mg/l $CaCO_3$)	SOFT (< 100 mg/l $CaCO_3$)
Cadmium[a]	.03	.004
Chromium	.05	.05
Copper	.03	.01
Lead	.03	.03
Mercury[b]	.0002	.0002
Nickel[c]	.4	.1
Zinc	.2	.004

a. Lower cadmium values not to be exceeded for crustaceans and waters designated SPWN are 0.003 mg/l in hard water and 0.0004 mg/l in soft water.

b. Total mercury values should not exceed 0.05 µg/l as an average value; maximum acceptable concentration of total mercury in any aquatic organism is a total B.O.D. burden of 0.5 µg/l wet weight.

c. Value cited as objective pertains to nickel salts (not pure metallic nickel).

1 RWQCB Water Quality Control Plan, September 1994

3.3.8 Warm Freshwater Habitat:

pH: The pH value shall not be depressed below 7.0 or raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 in fresh waters.

DISSOLVED OXYGEN: The dissolved oxygen concentration shall not be reduced below 5.0 mg/l at any time.

TEMPERATURE: At no time or place shall the temperature of any water be increased by more than 5^0F above natural receiving temperature.

CHEMICAL CONSTITUENTS: Waters shall not contain concentrations of chemical constituents known to be deleterious to fish or wildlife in excess of the limits listed in Table 3.3.7.

3.4.9 Fish Spawning:

CADMIUM: Cadmium shall not exceed .003 mg/l in hard water or .0004 mg/l in soft water at any time. (Hard water is defined as water exceeding 100 mg/l $CaCO_3$.)

DISSOLVED OXYGEN: The dissolved oxygen concentration shall not be reduced below 7.0 mg/l at any time.

3.3.10 Marine Habitat:

pH: The pH value shall not be depressed below 7.0 or raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.2 units.

DISSOLVED OXYGEN: The dissolved oxygen concentration shall not be reduced below 7.0 mg/l at any time.

CHEMICAL CONSTITUENTS: Waters shall not contain concentrations of chemical constituents known to be deleterious to fish or wildlife in excess of limits listed in Table 3.3.10.

Table 3.3.10. Maximum Toxic Metal Concentrations -- Marine Habitats

METAL	mg/l
Cadmium	. 0002
Chromium	. 05
Copper	. 01
Lead	. 01
Mercury	. 0001
Nickel	. 002
Zinc	. 02

3.3.11 Shellfish Harvesting:

CHROMIUM: The maximum permissible value for waters designated for shellfish harvesting shall be 0.01 mg/l.

BACTERIA: At all areas where shellfish may be harvested for human consumption the median total coliform concentration throughout the water column for any 30-day period shall not exceed 70/100 ml, nor shall more than ten percent of the samples collected during any 30-day period exceed 230/100 ml for a five-tube decimal dilution test or 330/100 ml when a three-tube decimal dilution test is used.

3.4 Water Quality Specific Objectives:

3.4.1 Surface waters: In addition to the general objectives, the RWQCB has established specific objectives for selected surface waters. In this project area, these waters include the Cuyama and Sisquoc Rivers. The objectives goals following are in mg/l.

	TDS	Cl	SO_4	B	Na
Cuyama River (near Garey)	900	50	400	0.3	70
Sisquoc River (near Garey)	600	20	250	0.2	50

3.4.2 Ground waters: The RWQCB has established median ground water objectives for the Santa Maria and Cuyama groundwater basins based on data averages. The objectives are based on the preservation of existing water quality or water quality enhancement believed attainable following control of point sources of pollution. Maps illustrating the groundwater basins are contained in Section 2.2. The following objective goals are in mg/l.

		TDS	Cl	SO_4	B	Na	N
Santa Maria -	Upper Guadalupe	1000	165	500	0.5	230	1.4
	Lower Guadalupe	1000	85	500	0.2	90	2.0
	Nipomo Mesa	710	95	250	0.15	90	5.7
	Orcutt	740	65	300	0.1	65	2.3
	Santa Maria	1000	90	510	0.2	105	8.0
Cuyama Valley -		1500	80	---	0.4	---	5.0

Section 4. WATER QUALITY ISSUES

4.1 Overview

The RWQCB and the U.S. EPA has identified NPS pollution as the leading cause of water quality problems throughout the United Sates, including the Central Coast Region. NPS pollution may be the result of human activities, natural leaching from the soil, and/or precipitates from the atmosphere. Individually, these sources may be insignificant, but they build upon each other during runoff or by sub-surface leaching to groundwater. Addressing this concern is critical if the health of the water bodies is to be maintained. In this region, maintaining the health of the groundwater basins is especially important since they are the primary sources of water.

The Santa Maria River watershed has a great diversity of uses ranging from extensive tracts of public land to intensive agricultural and urbanized areas. In general, NPS pollution resulting from human activities on public land is addressed by the respective land management agencies. Nonetheless, there is extensive geologic erosion in the Cuyama River reach of the watershed. There is also a continuing hazard of wildfire that can denude large areas and increase the erosion potential. While most of this erosion is a naturally occurring event, it is a significant contributor to the sediment loading in Twitchell Reservoir.

NPS pollution is generally defined under four categories; Erosion/sedimentation, Pesticides, Nutrient Contaminants and Microbiological contaminants.

- <u>Erosion/sediment</u>: Soil erosion and the transport of sediment is a natural function of hydrologic systems. However, excessive sediment can prevent waterways from functioning properly, effect the utility and economy of land, and have a significant economic impact on the public for cleanup costs. While sediment itself is not toxic it can absorb and transport chemicals and nutrients and contaminate wetlands. Excessive sediment can reduce water clarity and deposition can reduce the quality of habitats for many plant and animals.

- <u>Pesticides</u>: Chemical formulation and usage have changed significantly in the last several decades. Persistent old-generation chemicals such as DDT, chlorodane, and toxaphene have been banned and replaced by compounds that decay rapidly and are more target specific than the older broad spectrum chemicals. Current agricultural chemical use in California is closely regulated, with all uses requiring a report to the Agricultural Commissioner. Nevertheless, the risk of water contamination is directly related to the chemical formulation, timing, rate and method of application, and soil conditions and climatic conditions.

Many of the chemicals available to agriculture are also used for non-agricultural purposes such as pest control and urban landscape maintenance. Commercial urban pesticide users are subject to similar regulations that are imposed on agriculture; however, home use of pesticides is not regulated. Industrial and commercial chemical discharges are generally considered as point source discharges, and are not within the scope of this project. The control and discharge requirements of point sources are mandated by the RWQCB.

- Nutrients: Elevated nutrients, particularly nitrates, are a concern. Concentrations in groundwater can affect human health, and concentrations in surface waters can result in accelerating plant growth and that clogs waterways. It can also result in excessive algal blooms that lead to oxygen depletion. Nutrients can enter the water systems from agricultural and urban fertilizer applications, septic tank leaching, waste from animals, releases from rocks, and other natural sources such as plant and animal decomposition.

- Microbiological: Biological contamination can occur from a variety of sources including farming, livestock ranches, ranchettes, urban areas and natural sources. The most common forms of microbiological contamination are from fecal *coliform* bacteria, and parasitical infections from *Cryptosporidium parvum* and *Giardia duodenalis*. However, the possibility of contamination from other pathogens and disease producing bacteria and viruses exists.

  Perhaps the greatest microbiological risks in this watershed are from *Cryptosporidium* and *Giardia* contamination. Most of the surface waters in the watershed are subject to free access from domestic livestock and wildlife. Although there is no quantitative evidence, it has been assumed that cattle are the primary vectors for shedding *Cryptosporidium* oocysts. Other known carriers are feral pigs, elk, deer, and various rodents. The drainage basin has a modest population of pigs and elk, and a relatively abundant deer population. Rodents, particularly ground squirrels, mice, and wood rats are abundant. Some of the upland mammals are also known to be carriers of *Giardia* oocysts; however, the principal carriers in most regions are known to be beavers. Huasna River, the lower reaches of Alamo Creek, and the lower reaches of the Cuyama River both above and below the dam have healthy beaver populations. Beavers also migrate in or out of Twitchell Dam depending on water levels.

  There is no documentation to suggest that biological contamination is a concern in public water supplies; however, it might be prudent to perform tests at selected sites to determine if *Cryptosporidium* or *Giardia* oocysts are present. Private water wells should all be tested if the water is used for human consumption, and surface waters in the rural areas should never be consumed without proper treatment. According to the Center for Disease

Control, *Crytosporidium* has been found in over 65 percent of the nation's surface waters (Western Water, 1996).

Section 303(d) of the Federal Clean Water Act requires that states identify surface water bodies that do not meet water quality objectives for the designated beneficial uses, and to describe the pollutants that limits the use. The act also requires that states establish a priority list based on the severity of pollution, and develop Total Maximum Daily Load (TMDL) allocations for the affected water bodies. A TMDL is the amount of a specific pollutant that a water body can receive and still attains the water quality standard. TMDLs can be expressed in terms of mass per time, toxicity, or other appropriate unit of measure. As part of the TMDL process, the RWQCB identifies the waste load and allocation for point sources of pollution and non-point sources, including natural background. When these allocations are determined a margin of safety is added, and corrective measures are taken to implement improvement measures to the extent possible.

At the date of this publication, none of the surface waters in this project area has been placed on the 303(d) priority list. However, several of the surface waters do not meet the water quality standards for the designated beneficial uses. It is likely that they will be placed on the 303(d) list in the near future.

Groundwater standards are defined by Maximum Contaminant Levels (MCL) as defined in Title 22 of the California Code of Regulations. The RWQCB has also assigned water quality objectives for the basins in this project area as described in the previous section.

4.2 Groundwater Santa Maria Valley:

Numerous studies of the Santa Maria Valley ground water basin have been completed. Some of the reports date back to the early 1900s. The following water quality information was taken from reports published since 1976, arranged in chronological order:

- *Development of a Nonpoint source Pollution Control Program for Santa Maria Valley, California (Brown and Caldwell, May 1976).*

  This report examined the hydrologic and salt balance for the period 1959 through 1971 and concluded that there was a negative salt balance of 52,300 tons per year over the period. The report further states that approximately 80 percent of the salts could be attributed to irrigated agriculture. It also identified sources of specific nutrient pollutants such as nitrate, phosphate, potassium, and salts such as sodium, magnesium, calcium, chloride and sulfates. The sources cited include dairies, feedlots, municipal, industrial and the oil industry. Many of these sources are no longer present such as animal feed lots, almost all of the dairies, and a sugar beet processing plant. Others such as the oil industry are in decline. Most of the specific pollutant sources cited are, or would have been, considered point source polluters by current definition and required to obtain NPDES permits.

The report recommends that comprehensive research be completed to determine the minimum amounts of water, fertilizer and pesticides that could be applied to grow satisfactory crops without causing excessive water pollution. It also recommends that a pilot project be established using conditions established as a regulatory experiment. This experiment would impose limiting conditions for water and chemicals. At the same time it was suggested that technical monitoring be applied to the trial area to determine parameters for the program.

- *Santa Maria Valley Water Resources Study (Toups Corporation, July 1976)*

This report was prepared for the City of Santa Maria. It addresses many of the same issues in other reports. However, the conclusions concerning water quality and quantity are significantly different. Most of the differences are related to projections of overdraft. The Toups report calculated an average annual overdraft of 6,000 acre feet in 1975 increasing to 25,000 acre feet in 2025; whereas, the Santa Barbara County Water Agency (WA) overdraft estimate for 1976 was19,800 afy.

Part of the study included an examination of water quality from 16 wells using four parameters; total dissolved (TDS) sulfate (SO_4), chloride (Cl), and nitrate (NO_3). TDS ranged from 588 to 1649 mg/l, SO_4 from 68 to 780 mg/l; Cl from 28 to 286 mg/l, NO_3 from 2 to 68 mg/l. The highest concentrations were in areas of groundwater depression near Santa Maria and Guadalupe.

Future water salinity was projected using TDS as the parameter. Those projections showed increases ranging from 20-25 percent in the areas of groundwater depression, but no changes in other areas. The major contribution (94 percent) of salt was attributed to agriculture.

- *Evaluation of Ground-Water Quality in the Santa Maria Valley California (USGS, Hughes, July 1977):*

This report is by far the most comprehensive evaluation of water quality in the Santa Maria groundwater basin. The study includes both point and non-point sources as well as an evaluation of the surface waters entering the basin.

Point sources of waste discharges were identified as (1) discharges associated with sugar and oil refineries, (2) effluent from municipal wastewater treatment facilities, (3) landfills, (4) golf courses and (5) stockyards and feed lots. Some of the point sources identified in the report such as golf courses are non-point sources by current definitions. Some of the identified sites are no longer in business including the sugar and oil refineries, and the stockyards and feedlots.

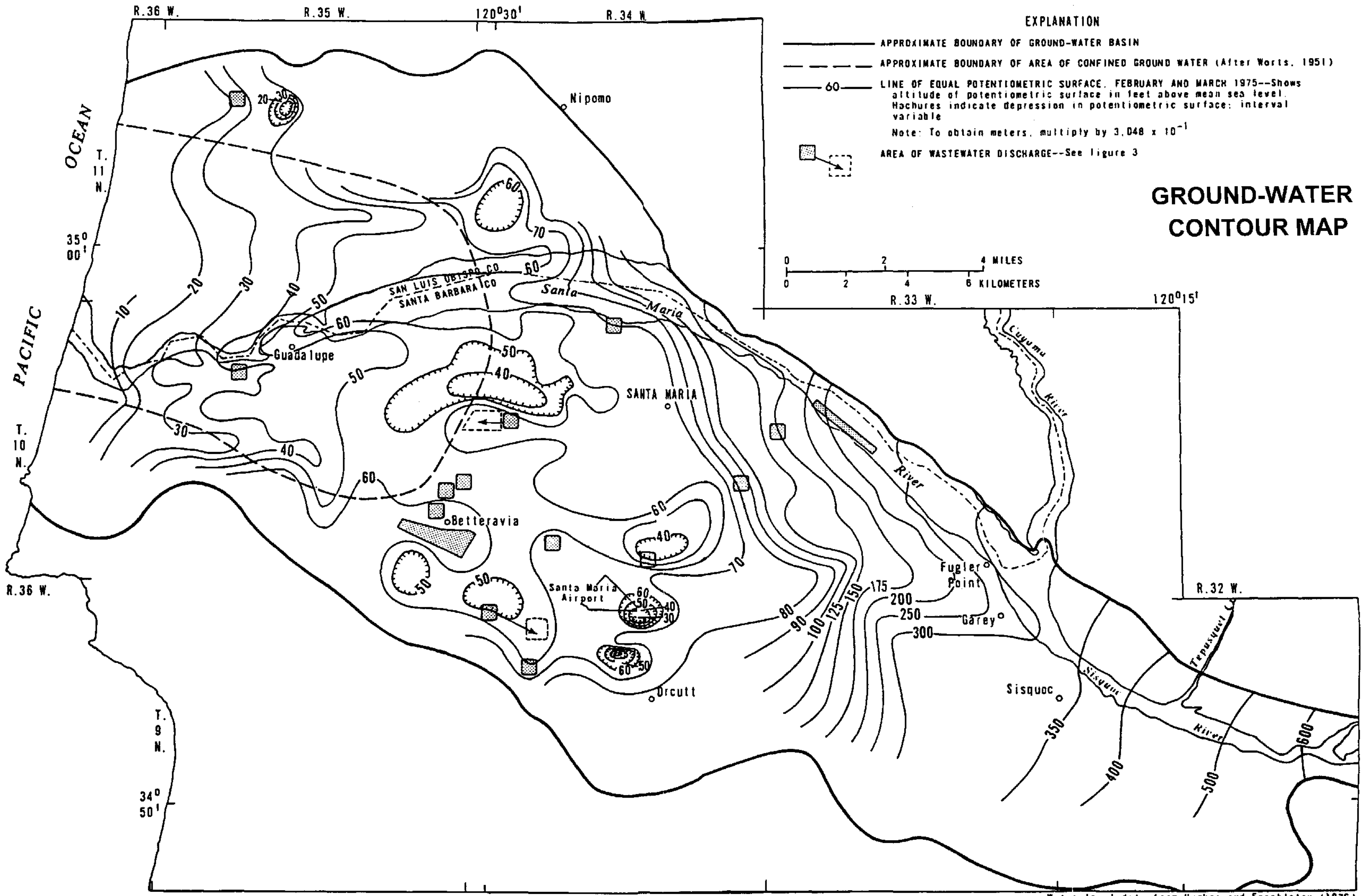
Nonpoint sources included (1) natural, (2) agricultural and (3) industrial activities related to oil production.

Hughes concluded that groundwater in the basin generally moves from east to west; however, he determined that there are several mounds and depressions that disrupt the general pattern (Figure 4.2A).

Measurement of the groundwater quality included well analysis for the distribution of dissolved solids, chloride, sulfate, calcium plus magnesium and nitrogen. His results are illustrated graphically in Figures 4.2B through 4.2F. Most of the elevated concentrations of dissolved solids, sulfate and nitrogen were attributed to return flows from irrigated agriculture, primarily as the result of salts remaining after evaporation and plant transpiration. Excessive applications of fertilizers and pesticides were also listed as contributors. The higher chloride concentrations were associated with regenerating water softeners used by city residents. Point sources were estimated to only contribute about 10 percent of the total load. Overdraft was also identified as a contributor to the solute balance. His 1975 estimate of annual overdraft was 10,000 acre-feet.

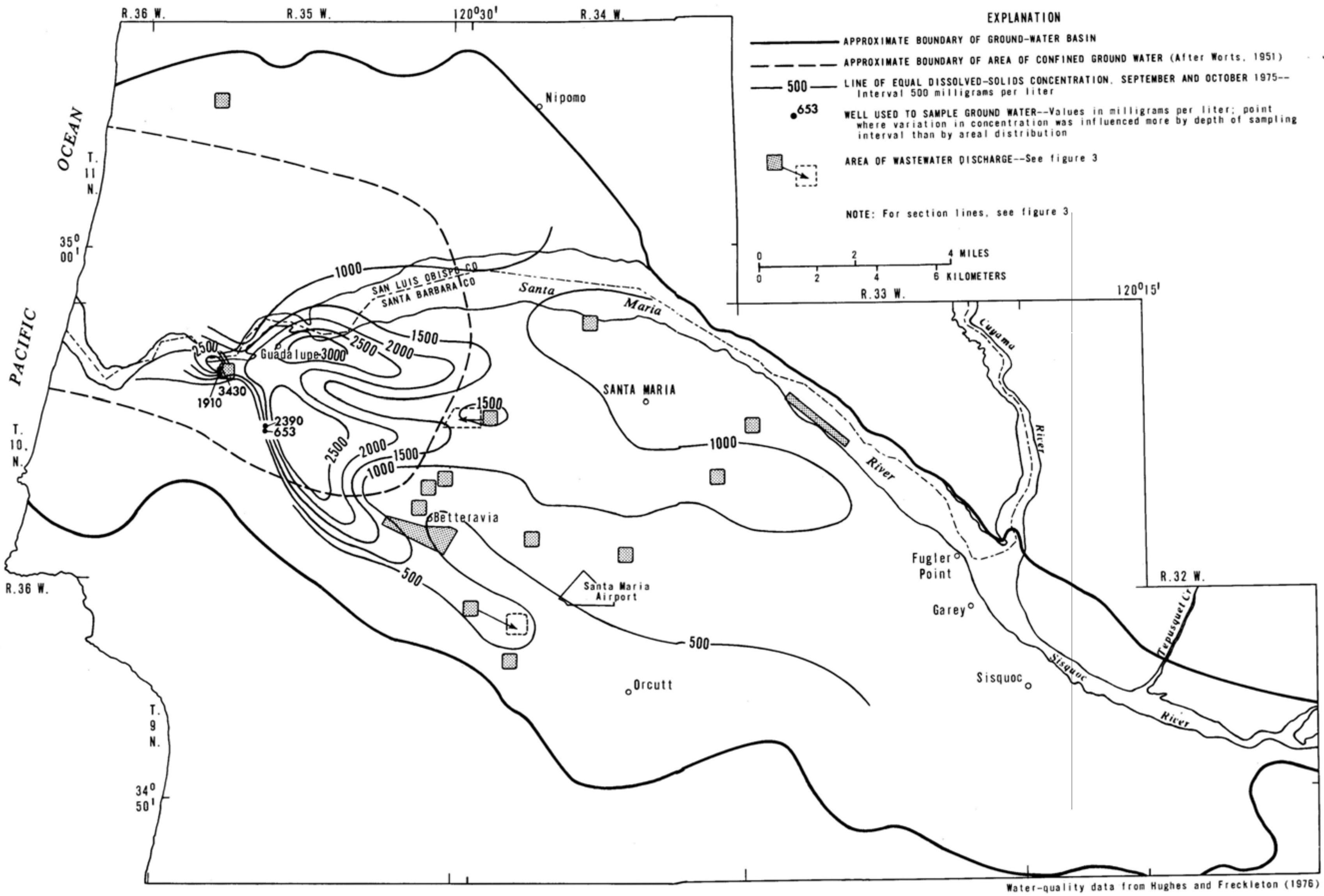
The study also included an analysis of groundwater for trace elements. Unusual concentrations of zinc were noted at two wells (320 µ/l and 580 µ/l) ; however, all other samples had less than 20 µ/l. The report also noted high concentrations of manganese, vanadium, and selenium, but no pattern of distribution was discerned. Boron concentrations in excess of 300 µ/l were noted in a pattern associated with the wastewater treatment plants for Santa Maria and Guadalupe. The highest concentration measured was 620 µ/l.

Figure 4.2A. Ground-water contour map of Santa Maria Valley.



Source: U.S. Geological Survey Report 76-128

Figure 4.2B. Distribution of dissolved solids in ground water, Santa Maria Valley, California.



USGS Evaluation of Ground-Water Quality in SMV, July 1977

Figure 4.2C. Distribution of chloride in ground water, Santa Maria Valley, California.

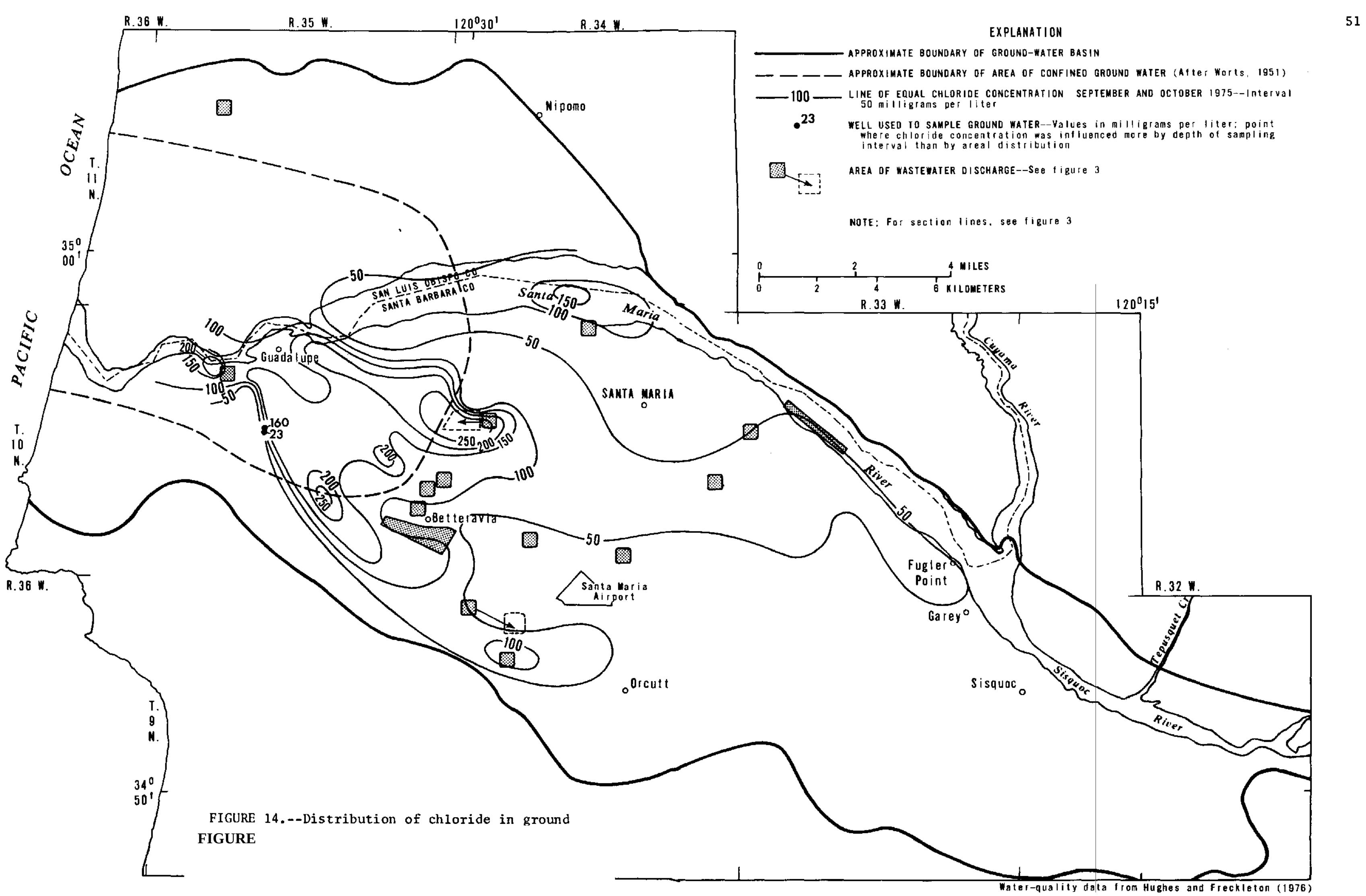
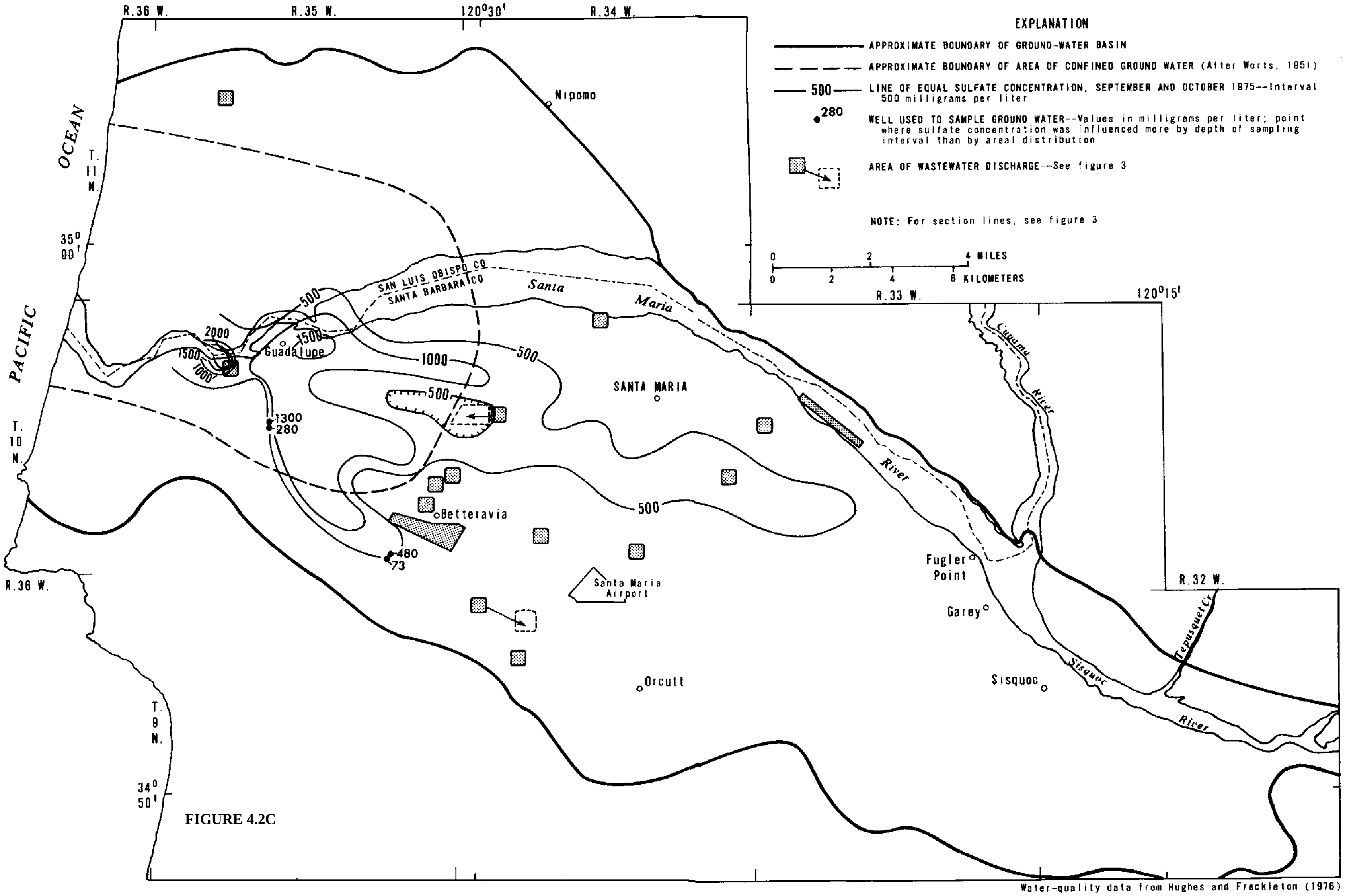


FIGURE 14.--Distribution of chloride in ground
FIGURE

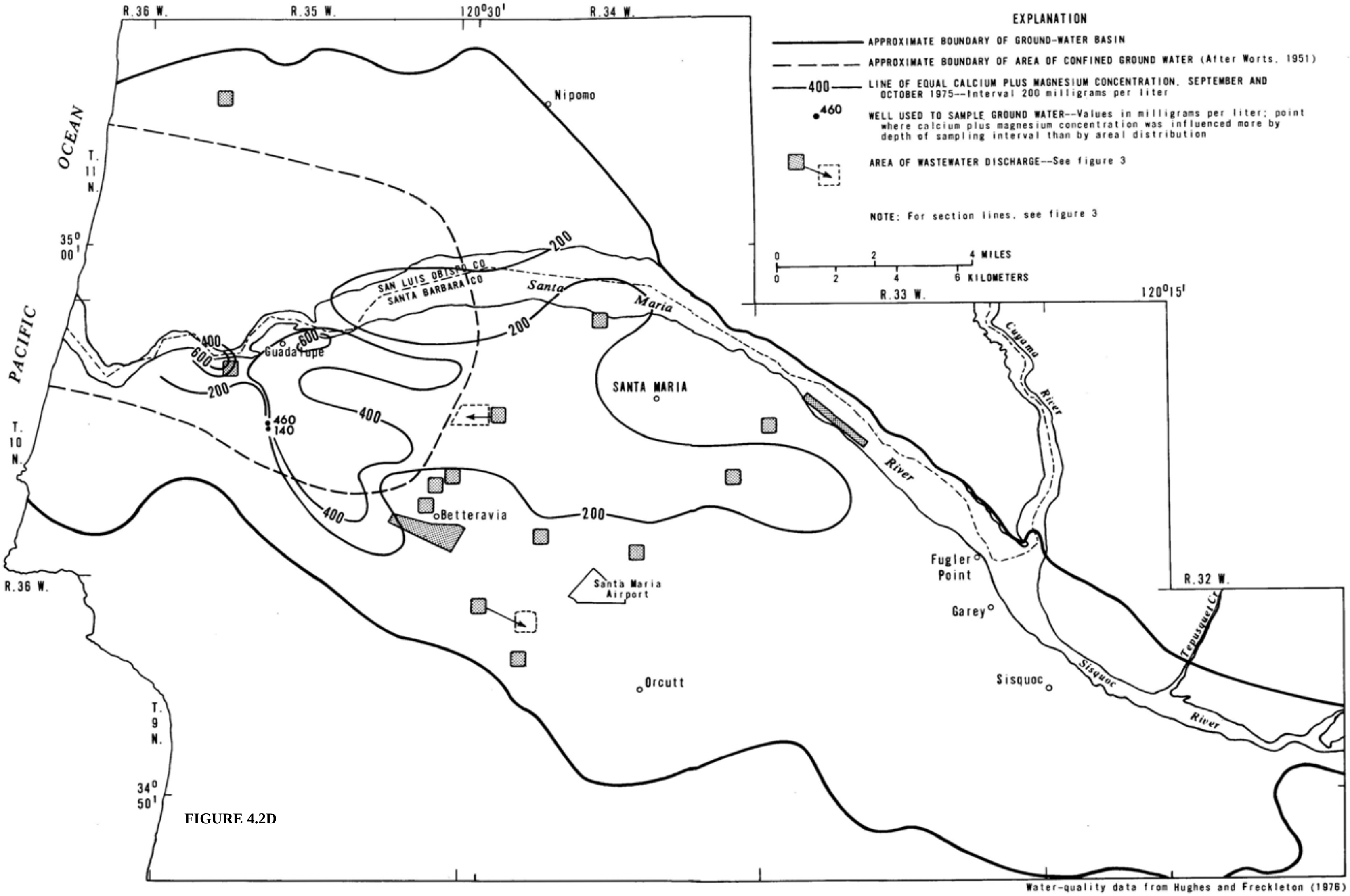
USGS, Evaluation of Ground-Water Quality in SMV. July 1977

Figure 4.2D. Distribution of sulfate in ground water, Santa Maria Valley, California.



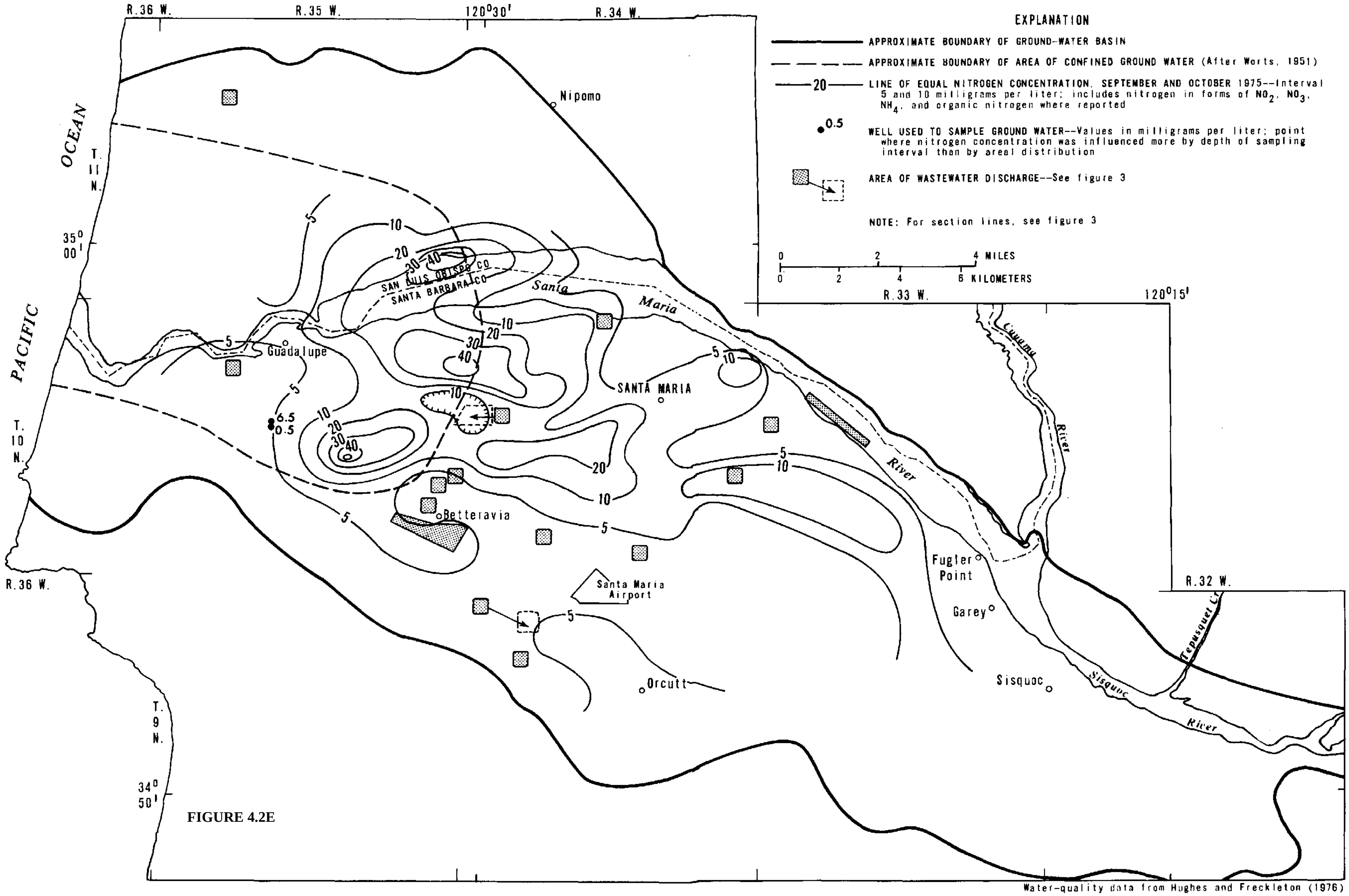
USGS, Evaluation of Ground-Water Quality in SMV. July 1977

Figure 4.2E. Distribution of calcium plus magnesium in ground water, Santa Maria Valley, California.



USGS, Evaluation of Ground-Water Quality in SMV. July 1977

Figure 4.2F. Distribution of nitrogen in ground water, Santa Maria Valley, California.



USGS, Evaluation of Ground-Water Quality in SMV. July 1977

- *Adequacy of the Santa Maria Groundwater Basin (Santa Barbara County Water Agency, Nov. 1977 Jones, etal).*

  This was a report to the County Board of Supervisors that largely focused on overdraft concerns. It has since been superceded and updated. The report concluded that there was a significant overdraft, and that the overdraft was largely responsible for declining water quality. This report suggested that the net salt accumulation was 48,500 tons per year in 1977, and would increase to 56,600 tons per year by 2000. Most of the increase was attributed to concentration of agricultural solutes because of applied chemicals and evaporation and transpiration. Evidence of this conclusion was presented by the build up of nitrates in the groundwater.

- *Santa Maria Valley Water Resources Report (Santa Barbara County Water Agency, 1994 Naftaly, etal).*

  This report examines ground water demand with consumptive use based on the 1990 census and models to estimate agricultural demand in 1990. The modeling suggests that there was an average annual overdraft of approximately 20,000 acre-feet in 1990. In this assessment, the author uses duty factors for applied water supplied by the UCCE resulting in what is termed “agricultural pumpage” of 130,619 afy. The report also notes that the DWR estimated the pumpage at 172,500 afy. In an examination of the report it appears that the “agricultural pumpage” is really the crop evapotranspiration rate (ET_c), and in reality the gross pumpage is much higher because of irrigation system inefficiencies and leaching fractions. The DWR report was probably accurate for gross requirements.

  Much of the report is dedicated to an examination of existing and potential programs to supplement or conserve water supplies. All of the programs, if implemented, would also improve water quality because of the dilution factor with increased water supplies.

  An assessment of the groundwater quality is generally limited because of the lack of comprehensive sampling data. The report suggests that a study such as that completed in1975 by the USGS be conducted to determine water quality and trends. Nonpoint sources of pollutants are discussed in general terms that suggest that re-circulated agricultural irrigation water, pesticides, and fertilizers are the primary causes. New sampling data was limited to 12 wells for the period 1985 to 1992. Measurement was limited to TDS and nitrate concentrations.

- *Assessment of Nitrate Contamination in Ground Water Basins of the Central Coast Region (RWQCB Dec. 1995)*

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In December 1995, the RWQCB completed an evaluation of 53 groundwater basins in the Central Coast Region. This report determined that 15 of the basins exceeded the California standard. The RWQCB also ranked the 15 contaminated basins relative to the degree of severity. The Santa Maria Basin was determined to be the third most contaminated from nitrates, and the Cuyama Valley Basin was the tenth.

The report includes a series of nitrate contour maps that illustrate changes in nitrate content in the groundwater from 1951 through 1995 (Figures 4.2G, H, I). A comparison of the maps shows several anomalies throughout the basin. They are the apparent result of insufficient well monitoring data in certain areas. Appendix M-1 in the referenced report contains a list of 400 well locations; however, none of the reporting periods illustrated incorporates a complete set of values from all of the wells. (All of the reporting periods had less than 50 percent of the wells included.) The latest era that was displayed (1981-1995) had the fewest samples of all. A table of the specific measurements for each well monitored is contained in Appendix M-2 of the report. The report recommends further sampling of 60 wells. No recommendations were included to mitigate the concern.

All periods indicate the existence of nitrate plumes near the towns of Sisquoc, Santa Maria and Guadalupe; however, the magnitude is highest in the most recent decade. In each of the elevated areas, the nitrate content is now at, or above the Maximum Contaminant Level (45 mg/l as NO_3) considered safe for human consumption.

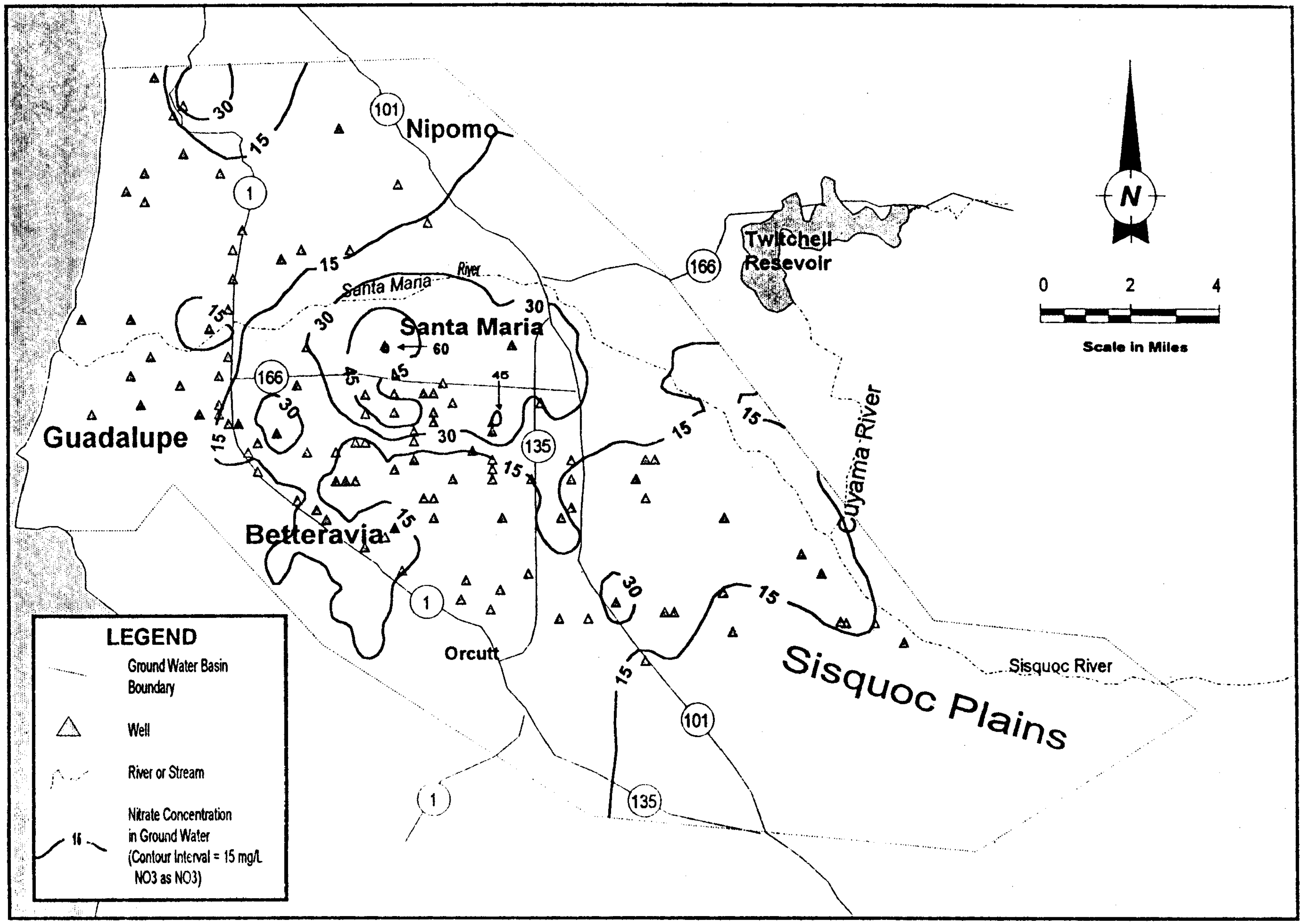
- *Santa Barbara County 1996 Groundwater Resources Report (Santa Barbara County Water Agency, June 1996 Naftaly, etal)*

This report provides a general discussion of the conditions of all groundwater basins in the county based on previously published technical studies of the basin. It does not include additional data concerning water quality except to note that importation of State Water Project water is expected to offset some overdraft concerns. The contracted combined total to be received from the project is 17,250 acre-feet per year (afy). However, the report suggests that the average annual yield will be closer to 13,000 afy.

- *Engineer's Report Special Assessments for Ground-Water Management (June 1997, Luhdorff & Scalmanini).*

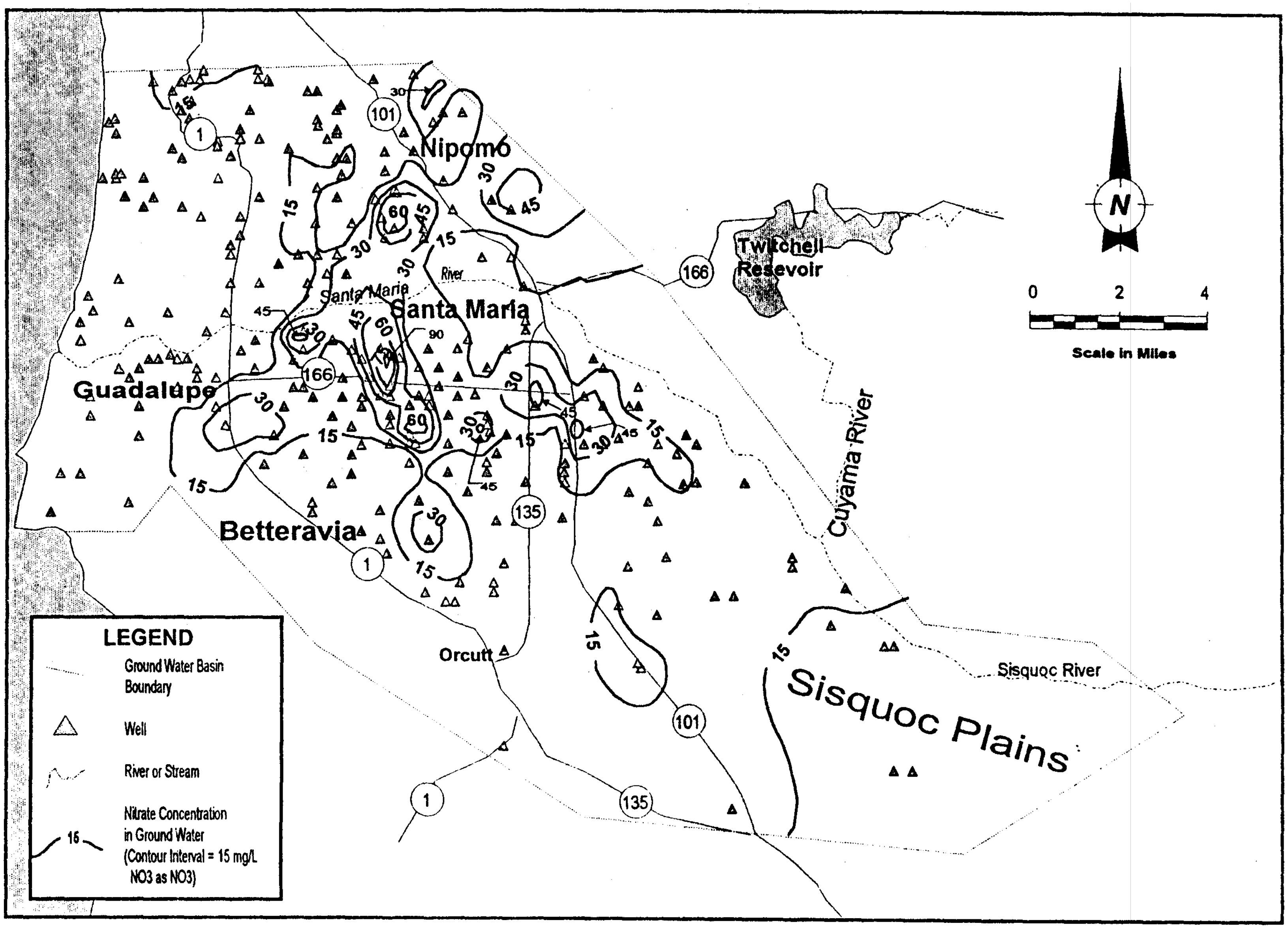
  This report was prepared for the Santa Maria Valley Water Conservation District to comply with legal requirements to impose special assessments. It largely focuses on the groundwater basin hydrologic condition. The study concludes that the basin is not in a state of overdraft. That assessment is based on an evaluation of groundwater elevations from 1920 to 1995. This conclusion is somewhat contrary to previously published reports that suggest that there is an overdraft, the degree of which varies from an average annual deficit of 6,000 acre-feet to 20,000 acre-feet depending on the study.

Figure 4.2G. Average Nitrate Concentrations in the Santa Maria Valley Ground Water Basin from 1951 to 1961.



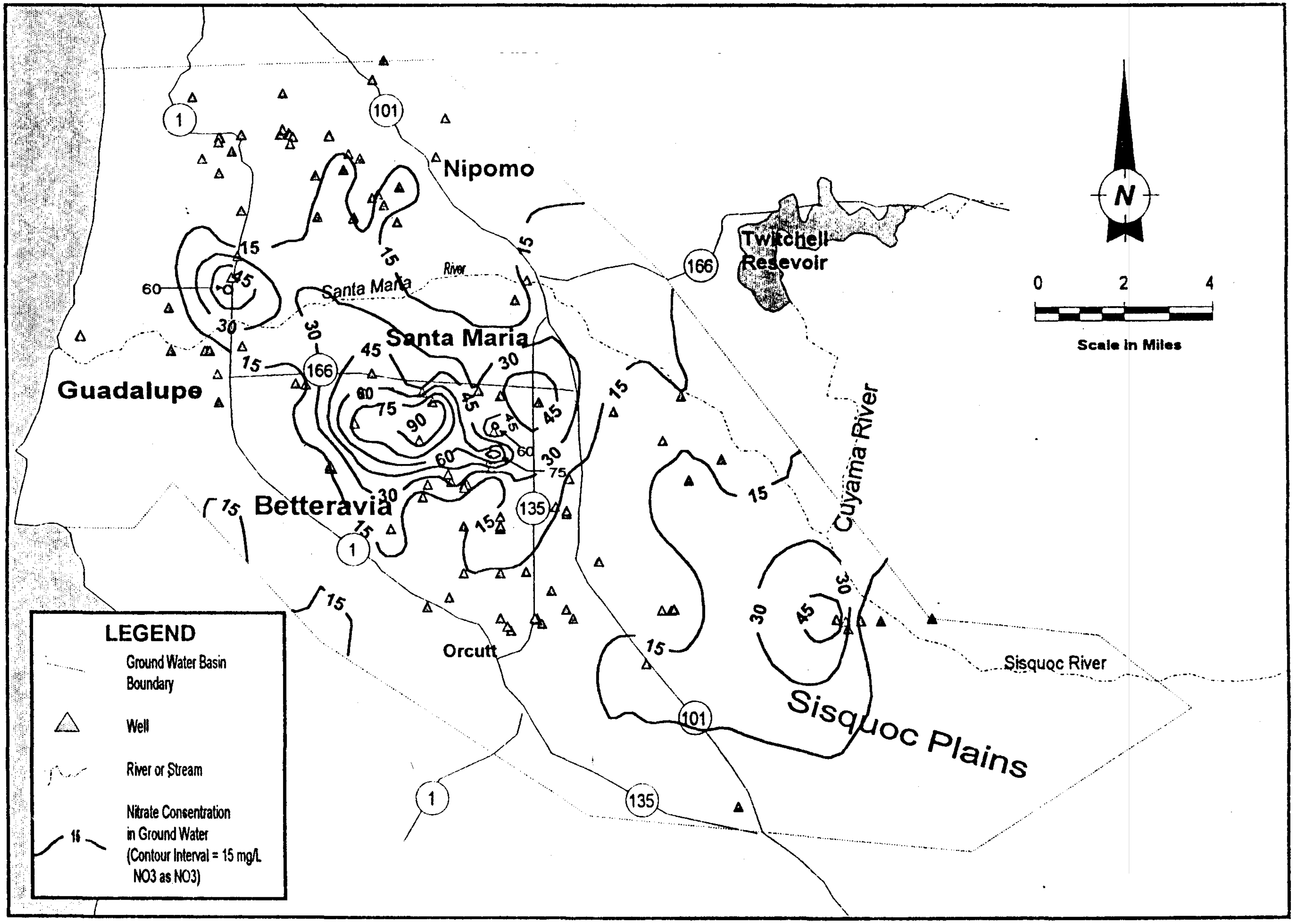
RWQCB Assessment of Nitrate Contamination in Ground Water Basins, December 1995

Figure 4.2H. Average Nitrate Concentrations in the Santa Maria Valley Ground Water Basin from 1952 to 1980.



RWQCB Assessment of Nitrate Contamination in Ground Water Basins, December 1995

Figure 4.2I. Average Nitrate Concentrations in the Santa Maria Valley Ground Water Basin from 1981 to 1995.



RWQCB Assessment of Nitrate Contaminatio in Ground Water Basins, December 1995

The report does not contain any new information concerning water quality, but refers to previously published documents. It basically concurs with conclusions from those reports in that a better understanding of the salt loading is required, particularly the need to formalize a monitoring plan which has been sporadic since the 1976 USGS report. The report also presents a work plan for the Water Conservation District to consider. Six actions were recommended: (1) Maintenance of Twitchell Dam to ensure continued groundwater recharge from controlled releases; (2) Development of a salt management plan; (3) Integration of State water into quality and quantity improvement; (4) Continued and expanded monitoring of the basin fluctuations and water quality; (5) A long-term plan to increase recharge associated with mining company excavations; (6) Development of models to analyze the effects of various management actions.

- *Santa Barbara County 1999 Groundwater Report (Santa Barbara County Water Agency (December 1999, Gibbs, et al).*

  This report updates the status of all groundwater basins in Santa Barbara and parts of San Luis Obispo and Ventura Counties. The report acknowledges previous documentation of declining water quality, particularly increases in salinity and nitrate concentrations. The report includes a reassessment of previous estimates of average annual overdraft. With allowances for the importation of State water, the estimated overdraft is now estimated to be 8,000 acre-feet. The report also suggests that return flows from the State water may help to improve overall water quality because it is inherently of much better quality than the groundwater.

- *Santa Maria Times Article (March 1, 2000, Escalante-Conel).*

  This article was in response to a report from the Director of Public Works to the Santa Maria City Council that showed a fluctuation of nitrate levels in Santa Maria's water wells throughout the last nine years. At times, those levels have exceeded the maximum safe drinking water standards established by the State of California Department of Health Services. One of the city's eight active wells was recently off line for nine months due to high nitrate levels.

- *Personal communication with California Cities Water (Roger Brett, 2000)*

  Cal Cities Water, suppliers of water to Orcutt and Sisquoc areas, pump water from 29 active wells. Four of these wells have been shut down due to high nitrates levels (> 45 ppm). In addition, approximately 15 of the remaining wells have nitrate levels that fluctuate toward the higher levels and 5 of those wells have nitrate levels above 30 ppm.

Summary:

(1) Recharge of the basin is extremely important in improving the salt balance. Several reports use models to assess the state of the basin relative to safe yield. The assessments of the basin condition vary considerably, ranging from no overdraft (Lundorff & Scalmanini) to an estimated annual average overdraft of 8,000 acre-feet (WA). Older reports estimated the overdraft ranging from 6,000 acre-feet (Toups) to 20,000 acre-feet (WA). The latest WA report (1999) now estimates that the overdraft is approximately 8,000 afy based on credits for State water importation. This report uses consumptive use estimates taken from previous WA reports. The WA models include examinations of the historic groundwater elevations as well as estimates of water consumption by the various users. The Lundorff & Scalmanini (L&C) report only uses the historic groundwater elevations in their assessment.

It may be prudent to re-examine the basin. The L&C analysis is based on after the fact impacts; i.e., an examination of historic groundwater elevations. Several factors could affect the future condition of the basin that could have a significant impact on safe yield, but not become apparent for an extended period. For example, Twitchell Reservoir was estimated to increase recharge to the basin by an average of approximately 20,000 acre-feet per year through controlled releases from water stored in the conservation pool. The capacity of the storage pool has since been severely compromised by sediment accumulation. This accumulation has currently displaced about 26 percent of the conservation pool capacity so the recharge capability is certainly diminished, and it is decreasing at an average rate of about 1,200 acre-feet per year. Secondly, the L&C report suggest that the recharge some of the basin stability might be attributed to the "leveling off" of agricultural demand. The fact of the matter is that irrigated agriculture has increased substantially, particularly within the last decade.

The WA reports estimate safe yield based in part on historic groundwater elevations, estimates of agricultural usage, and metered M & I usage. Some of the duty factors used in estimating agricultural water use may not be valid, and there have been changes in cropping patterns and acres irrigated. The most recent assessment of water use (1994) uses a duty factor for "Applied Water". Apparently, this is a crop evapotranspiration (ET_c) value – not the gross pumping requirement as implied. Some of the ET_c duty factors should also be reviewed. For example, the duty value assigned to annual row crops (truck crops), the most common crops grown, apparently is based on producing two crops per year. In reality, some farmers produce at least 2 ½ crops per year. Conversely, the duty factor for grapes should be about 1.3 feet, not 2.0.

None of the reports accounts for losses of water out of the groundwater basin when calculating safe yield. Because of system inefficiencies, and perched water tables in the western end of the valley, some water is discharged to the ocean or Oso Flaco Lake. (The perched areas are all drained with sub-surface tiles.) Another concern not addressed is an increasing water loss through evaporation. Even if there is no further growth in agriculture, the pumping demand will increase because of increasing salinity. Larger leaching fractions will be required to produce the same crop yields. The plant transpiration rates would remain the same, but evaporation will increase because of the additional water exposed to the atmosphere.

(2) Well sampling has been sporadic and somewhat random. Multiple agencies collected samples, but there does not appear to be any coordination between the agencies. There is a need for a centralized database, a prescriptive grid and sampling protocol, and scheduling procedures to provide the consistency to make accurate assessments of the groundwater condition.

(3) Nitrate levels in some areas of the basin exceed, or are very near the public health limit of 45 mg/l, and the apparent trend is that they are increasing. The most acute regions are in the vicinity of Guadalupe, Santa Maria, and Sisquoc which coincidentally are also areas of groundwater depression. This is the apparent product of agricultural fertilizer leaching.

(4) Salinity is increasing throughout the basin primarily due to agricultural activities in part from leaching applied chemicals that are not consumed by the plants, and partly from return irrigation flows with salt concentrations as the result of evaporation. (Basin recharge from the Santa Maria River is also moderately saline. Water samples taken by the RCD indicated a relatively constant electrical conductivity reading of 1.2 mmhos/cm during summer releases from Twitchell Dam. These measurements were taken at the Bull Canyon road crossing.)

(5) Elevated boron, sodium and chloride levels near effluent discharge areas are likely from urban sources. Elevated levels of any of these elements could affect crop productivity; however, the concern may be mitigated with the importation of State water. This water quality will preclude the need for water softeners which should reduce the sodium and chloride levels.

(6) A large part of the recharge comes from the Cuyama River. This watershed has an inherently high concentration of dissolved solids. A large part of the concentration is calcium sulfate (gypsum) which is a likely reason that the soil alkalinity is not elevating.

4.3 Groundwater Cuyama Valley:

Unlike the Santa Maria Valley basin, the Cuyama Valley groundwater basin has had limited study, perhaps because there is only a small demand for domestic and industrial use. Historically, and under present conditions, the agricultural demand accounts for at least 98 percent of groundwater use.

There was no significant development of groundwater until the early 1940s. However, between 1940 and 1946 the irrigated area increased from about 300 acres to 5,000 acres. Electricity was introduced in 1946, and irrigated crops increased rapidly. By 1980, the irrigated area increased to about 20,000 acres. In 2000 there were approximately 28,000 irrigated acres.

The following is abstracted from published reports:

- *Ground Water in the Cuyama Valley California (Upson & Worts, USGS 1951):*

This was the original study of the geology and groundwater system in the valley. The authors concluded that the perennial safe yield of the basin was between 9,000 and 13,000 acre-feet a year.

As part of the study, the USGS compiled a record of the water chemistry of several wells and a few surface waters – 66 samples were gathered. The well samples included both domestic and irrigation sources of water. About one-half of the samples were taken in 1942; the rest were taken in 1947. These analyses were limited to chloride (Cl), total hardness expressed as $CaCO_3$, and salinity expressed as electrical conductivity (EC).

There was a great variance in concentrations with Cl values ranging from 8 ppm to 151 ppm in well waters, hardness from 800 ppm 3900 ppm, and EC from 0.73 to 5.8 mmhos/cm. (The upward extremes were all associated with the water source proximity to the Caliente Mountain Range, and not representative of the basin in general. The mountains are developed from Miocene era marine deposits, and leaching from the formation was noted as the likely cause of the poor water quality in those areas). Most of the wells measured between 800 and 1200 ppm total hardness, and had much lower Cl values. In general, the best water quality was at the east-end of the basin and poorest on the west-end. However, there were marked variations in several locations. In most cases, these variations were explained to be a product of leaching from the local geologic formations.

The study also included 29 detailed chemical analyses derived from "other" agencies or persons. The samples include various wells, several springs and the Cuyama River above and below the aquifer. No record of flow rate is indicated for the Cuyama River samples, but it is interesting to note that the outgoing measurement of sulfate and TDS is approximately double. (SO_4 730 ppm, > 1,500 ppm, and TDS 1,300 ppm > 2,800 ppm). There was also a marked increase in Cl going out (5.7 ppm > 95.0 ppm). See Table 4.3.

- *Pumpage and Ground-Water Storage Depletion in Cuyama Valley, California 1947-66 (Singer & Swarzenski, USGS 1970):*

Most of this report was focused on estimating the effects of agriculture on the groundwater basin. The basis for estimating agricultural water use was the cropping pattern in 1966. Since the original USGS study, irrigated agriculture had increased from approximately 400 acres in 1939 to 10,500 acres in 1966. Based on the cropping pattern and hydrographs of the groundwater elevations from 1934 through 1966, the authors concluded that the basin was being depleted by an average of 21,000 acre-feet annually. (Approximately 75 percent of the crop acreage in 1966 were alfalfa, sugar beets, or irrigated pasture - all of which have a high water demand when compared to other crops. Approximately 50 percent of the area was flood irrigated in 1966. Presumably, those systems had low efficiencies because of the rather permeable soils and a lack of precision land leveling.)

Water quality was reviewed in narrative form. The report noted that the groundwater was of fair quality, but concluded that the need for high leaching fractions required to grow crops was contributing to degrade the groundwater. Dissolved solids were reported to range from 1,500 to 1,800 mg/l in the central part of the basin. Water in this region was noted as being very hard and predominantly calcium-magnesium sulfate type. Conversely, in eastern part the TDS was only 400 to 700 mg/l.

Inferior quality water was noted for some wells located close to the Caliente Range. TDS in those wells ranged from 3,000 to 6,000 mg/l. Chloride and boron concentrations were also high at those locations with measurements ranging up to 1,000 mg/l and 15 mg/l, respectively. Chloride and boron concentrations were less than 30 and 0.20 mg/l, respectively, in other parts of the basin. The poor quality water was attributed to leaching from the adjacent mountains that are marine in origin.

- *Assessment of Nitrate Contamination in Ground Water Basins of the Central Coast Region (Carpenter, etal RWQCB, 1994):*

This report, for assessment purposes, considered the ground water basin as a single, hydraulically continuous water body. However, it acknowledges that there are some areas of local confinement. The report includes well monitoring for nitrate content from 1960 through 1994. To determine trends the well samples were broken into three periods: the 1960s, 1970s, and 1980-1994. Figures 4.3A, 4.3B, and 4.3C illustrate nitrate contours for the respective monitoring periods. (Copies of the individual well records are available in Appendix E-2 of the referenced document.)

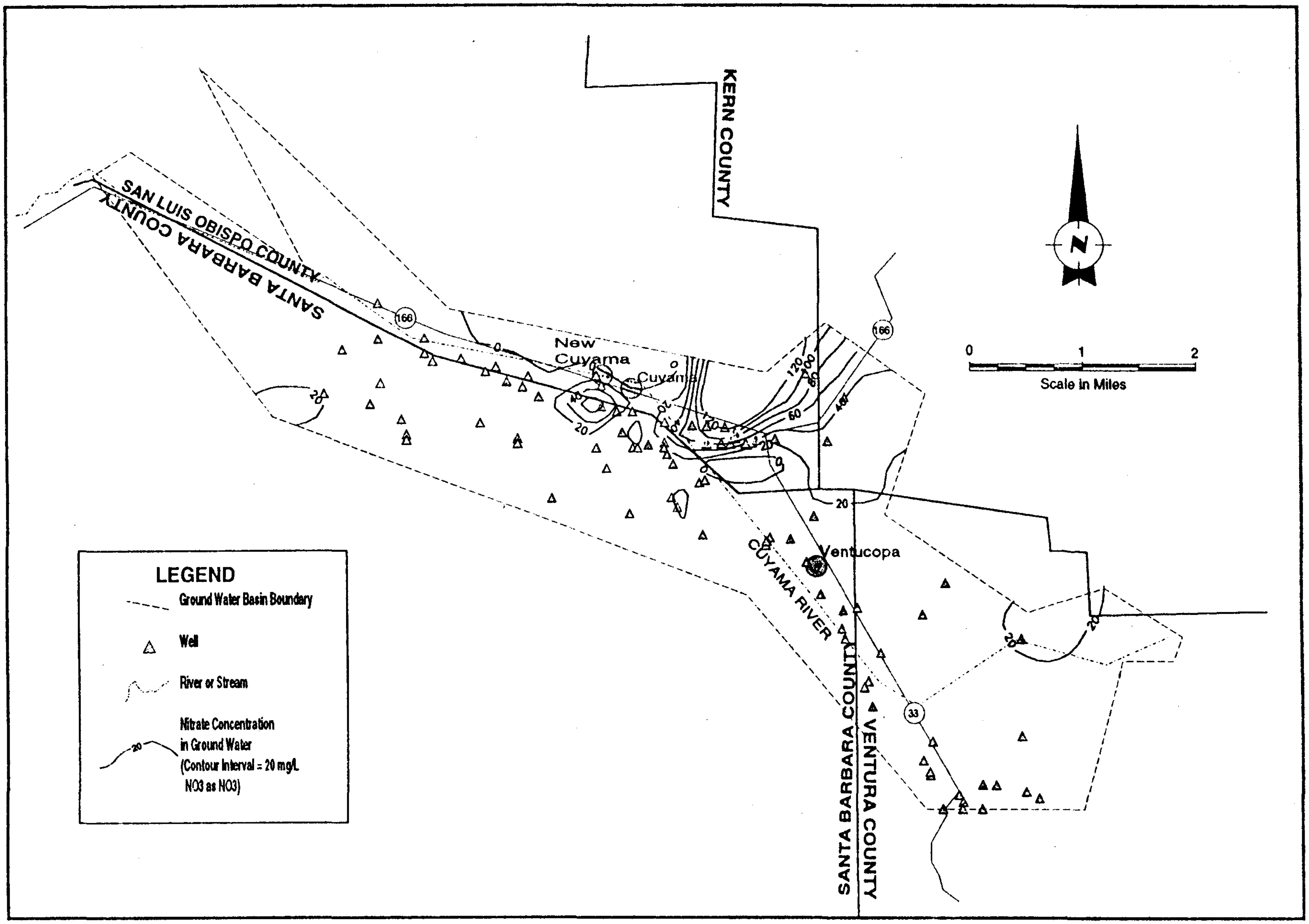
The 1960s era (Figure 4.3A) displays the most severe nitrate contamination of the three periods. This period had more well samples than the subsequent periods. It also displays the most severe nitrate contamination particularly in the region southeast of Cuyama where there were measured average nitrate concentrations of 120 mg/l. However, the northwest and southeast portions of the basin do not show a nitrate contamination problem.

Figure 4.3B representing the 1970s era illustrates an overall reduction in nitrate concentration, particularly in the primary area of concentration southeast of Cuyama. However, the report suggests that this display is not truly indicative of a trend because a significant number of wells that were included in the earlier analysis were not monitored. Of particular importance were missing well samples from the area with the highest concentrations. Nonetheless, there was still a plume that exceeded the State maximum contaminant level of 45 mg/l.

Figure 4.3C illustrates the 1980-1994 period. This display, in general, is consistent with the 1970s display. However, even fewer water samples were analyzed.

The report does not make any conclusion that the nitrate contamination is diminishing because there is a significant lack of well samples from 1970 on. Many of the missing sample sites also coincided with sites of highest contamination in the 1960s. The RWQCB recommends that approximately 25 specific wells be monitored to provide a more detailed picture.

Figure 4.3A. Average Nirate Concentrations in the Cuyama Valley Ground Water Basin from 1960 to 1969.



RWQCB Assessment of Nitrate Contamination in Ground Water Basins, December 1995

Figure 4.3B. Average Nirate Concentrations in the Cuyama Valley Ground Water Basin from 1970 to 1979.

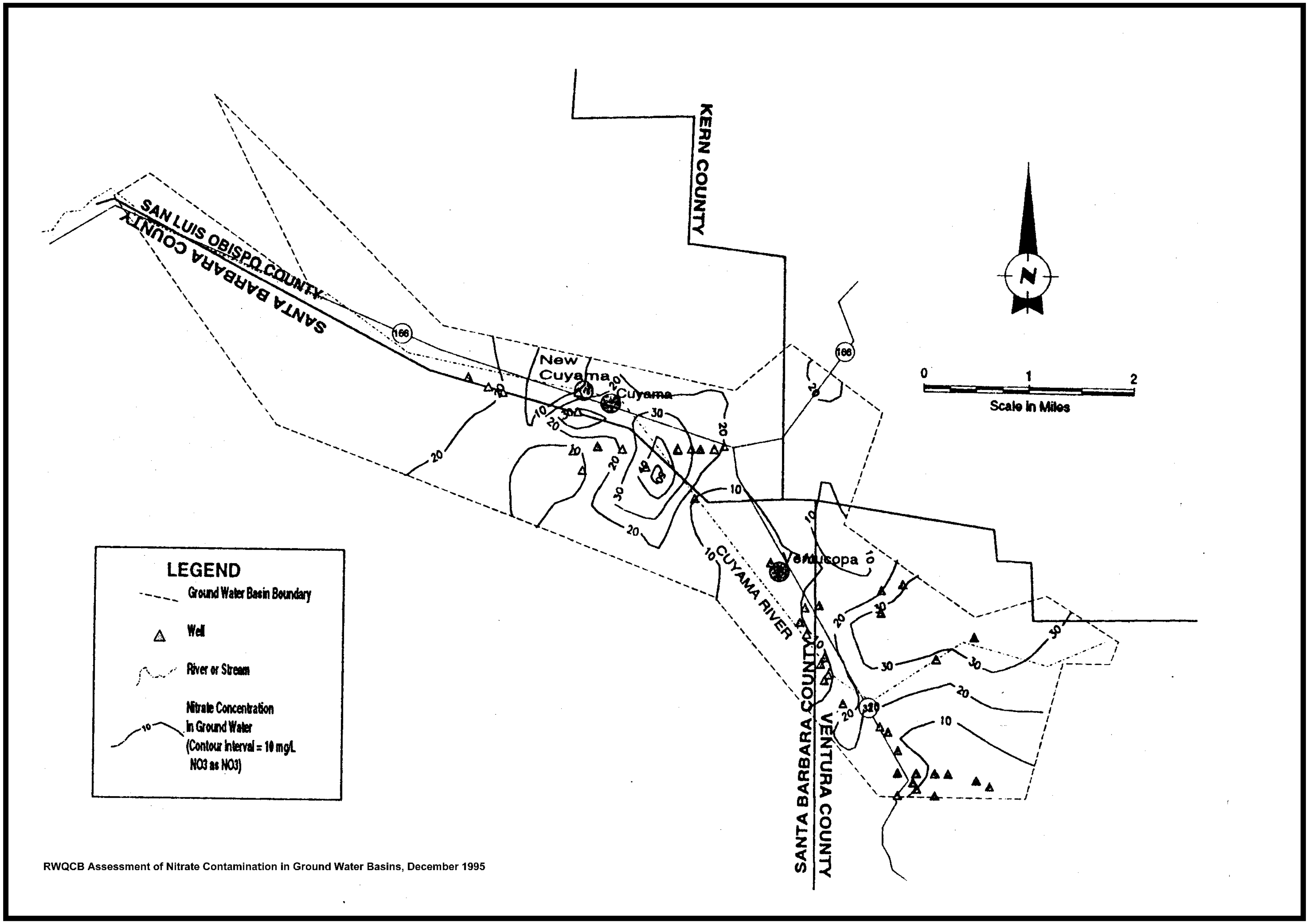
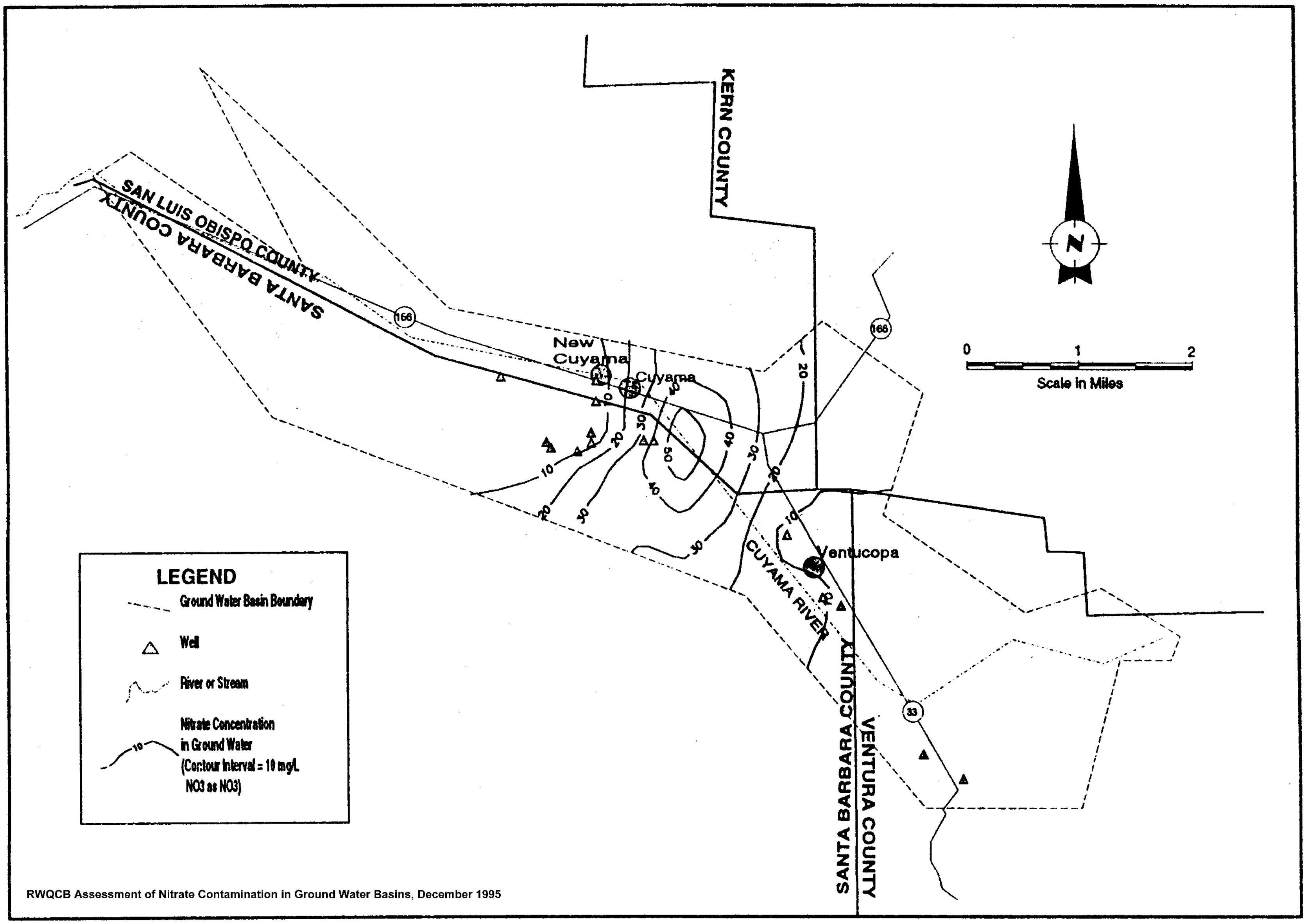


Figure 4.3C. Average Nirate Concentrations in the Cuyama Valley Ground Water Basin from 1980 to 1994.



- *Santa Barbara County 1996 Groundwater Resources Report (Naftaly,etal, WA June 1996):*

This is a brief report that concluded that under 1996 conditions the basin was over drafted by an average of 28,000 acre-feet per year. No discussion of water quality is included except to note that constant cycling and evaporation of irrigation water has resulted in decreasing water quality.

- *Santa Barbara County 1999 Groundwater Report (WA, Gibbs, et al 1999):*

The report updates the 1996 report only to the extent that it suggests that the average annual overdraft is now likely to be in excess of 28,000 acre-feet as previously estimated.

- *Personal communication with USGS Santa Maria (Jill Densmore, 1999)*

Table 4.3 was abstracted from the Upson & Worts, USGS 1951 report and the USGS well monitoring completed between 1970 and 1997. It is difficult to correlate water quality trends because the sampling was sporadic and does not provide a continuous record at any of the sites.

Table 4.3. Groundwater quality analysis in the Cuyama Valley from 1940's to 1990's.

	1940's [1	1970's [2	1980's [3	1990's [4
EC (µS/cm)	--	440 - 4940	1060 - 2640	1010 - 2520
pH	--	7.0 - 8.9	7.0 - 7.9	7.4 - 7.9
HCO_3 (mg/l)	154 - 560	99 - 420	--	--
$CaCO_3$ (mg/l)	401 - 1370	110 - 2600	180 - 1400	160 - 1300
Ca (mg/l)	104 - 358	52 - 520	56 - 330	52 - 290
Mg (mg/l)	36 - 122	8 - 307	9 - 140	7 - 120
Na (mg/l)	34 - 521	12 - 424	90 - 220	94 - 230
K (mg/l)	2.6 - 8.8	0.8 - 7.3	2.2 - 6.0	1.0 - 5.8
Cl (mg/l)	6 - 805	0.1 - 160	8 - 93	10 - 86
SO_4 (mg/l)	324 - 1850	110 - 2900	170 - 1400	96 -1400
F (mg/l)	0.3	0.4 - 1.9	0.3 - 0.8	0.1 - 0.8
B (µg/l)	10 - 1400	40 - 2200	130 - 720	50 - 380
Fe (mg/l)	--	10 - 800	3 - 200	3 - 65
TDS (mg/l)	766 - 3070	422 - 4880	646 - 2190	622 - 2130
NO_3 (mg/l)	--	0 - 180	--	--

[1 Chemical analysis of 29 sites of wells, springs and stream waters in the Cuyama Valley from 1940 - 1947 from USGS Ground Water in the Cuyama Valley.

[2 USGS Samples from 21 wells

[3 USGS Samples from 8 wells

[4 USGS Samples from 6 wells

Summary:

(1) Farming in Cuyama Valley has undergone a rapid transition in the last decade converting from a largely alfalfa hay region to a diversification that includes various vegetables and perennial fruits and nuts in addition to alfalfa. With this diversification, the gross product value for the region has increased substantially making a significant contribution to the economy of Santa Barbara, Ventura and San Luis Obispo counties. However, accurate assessments of the groundwater basin are lacking. The assessments of water quantity are minimal and primarily based on old information that may no longer be valid.

The estimates of water consumption are obviously grossly under estimated. The principal annual crop in this area is carrots which have a high ET_c, and there are about 9,000 acres of perennial crops. The rotation systems for the annual crops may include carrots (primary), followed by other vegetables or grain and may include some fallow acres. Nonetheless, the ET_c for all crops is probably triple the last WA estimate of 28,000 afy. Some areas also require a high leaching fraction because of the relatively poor water quality which also increases losses through evaporation.

The 1951 USGS groundwater study suggests that the perennial yield is between 9,000 and 13,000 acre-feet. Even if this study is off by 100 percent, it appears that there is a severe annual overdraft. A groundwater study of this area is highly recommended.

(2) The sources of nitrate contamination are difficult to determine. At least part of the source may be from natural causes. Until the introduction of electricity in the late 1950s, there were less than 5,000 irrigated acres. With the introduction of electricity, the irrigated acreage rapidly increased to about 20,000 acres. That irrigated area remained constant until recent years when considerable expansion took place. At present, there are approximately 28,000 irrigated acres. In the early years, most of the crops produced required some nitrogen fertilizer applications; however, during the period of rapid growth and until the late 1980s the preferred crop was alfalfa. At any period, alfalfa accounted for approximately 75 percent of the irrigated crops. The other acres were either fallow, or in some cases used to produce an annual rotation crop. Alfalfa crops were rotated in three to five year cycles, and since the crop had nitrogen fixing capability no nitrogen fertilizers were applied. In addition, it is likely that there was enough residual nitrogen available in the soil from decomposition of alfalfa so that little if any additional nitrogen would have been required to produce the rotation crops. Since there always has been a record of excessive nitrate in the groundwater throughout the cropping history, it is likely that at least part of the source is from natural causes.

(3) Well monitoring for water quality has been sporadic and limited to just a few locations since the original study in 1951, and there are no continuous records at any of the monitoring locations. Water quality ranges from very poor in the areas adjacent to the Caliente Mountains to relatively high quality on the eastern end. Most of the irrigation water source is of fair quality with TDS ranging from 1,500

to 1,800 mg/l. On the eastern end of the aquifer, TDS ranges from 400-700 mg/l. The water is very hard and predominantly calcium-magnesium sulfate type. Presumably, the high leaching fractions required are accelerating the salt load; however, there are no reliable records to support this conclusion.

4.4 Surface Water – Rivers and Streams:

- *Natural sources:*

There is limited documentation of river and stream water quality. The USGS (Hughes,1976) examined stream data taken in 1906 and compared it to samples taken in the 1960s. (The 1960s data was from samples taken in the Cuyama River below Twitchell Dam. Twitchell Dam became operational in 1959.) The report established that there an inverse relationship between flow rates and selected solute concentrations. It also established that the dam influenced water quality by its dilution effect. Table 4.4A is a condensed from data contained in the report, and supports these conclusions. (Since the only samples used before the dam was constructed were taken in 1906, one has to assume that the sampling measurements are valid when compared with the more modern samples.)

Table 4.4A. Water Quality - Cuyama River Below Twitchell Dam (1906 & 1960's)

Years Taken	Flow (cfs)	Ca	Mg	Na	HCO3	SO4	Cl	TDS	CaCO3	EC	pH
1906	--	170-460	60-160	78-300	190-320	560-1700	48-140	1510-3250	--	--	--
1960-1970	0.5>15.0	120-190	44-100	56-140	210-370	400-770	51-95	1230-1590	520-940	1.22-2.06	7.4-8.1
1960-1970	82>288	77-94	28-44	40-63	120-230	190-260	25-34	530-875	310-510	0.74-0.83	7.3-8.3

Notes: 1) All constituants are in mg/l except E.C. which is in mmhos/cm and pH.
2) No flows were recorded for the 1906 measurements. Presumably the lower values were related to measurements taken at higher flows.
3) Twitchell Dam became operational in 1959.

In addition to the Cuyama River measurements, samples were also analyzed for Alamo Creek, Cuyama River above the dam, Huasna River, Tepusquet Creek, Foxen Creek, Sisquoc River at three locations and Nipomo Creek. In all cases, only one or two samples were taken. Measurements revealed that all of those streams had lower water chemistry values. In comparing the Cuyama River with other major streams in the watershed, the report concluded that surface waters contribute an estimated average solute load of 57,000 tons per year, most of which (48,000 tons) comes from the Cuyama River.

The report also suggested that there are significant solute contributions from runoff associated with gravity flow irrigation. This conclusion was based on several electrical conductivity measurements that ranged between 2.0 and 3.0 mmhos/cm. These measurements were apparently taken from drainage ditches at random locations.

- *Urban sources:*

Urban land use and practices are presumed to significantly add to the nonpoint pollution load in surface and the groundwater, although no definitive studies have been completed locally. Table 4.4B is adapted from a national study (Horner, et al 1994). It shows some of the potential pollution sources and the contaminants they produce.

Table 4.4B. Urban Runoff Pollutant Sources.

	Contaminants						
Source	Solids	Pathogens	Metals	Oils	Synthetic Organics	Nutrients	DO Demands
Soil erosion	●		●			●	●
Cleared vegetation	●					●	●
Fertilizers						●	
Human waste	●	●				●	●
Animal waste	●	●				●	●
Vehicle fuels and fluids	●		●	●			●
Fuel combustion				●			
Vehicle wear	●		●				●
Industrial and household chemicals	●		●	●	●	●	●
Industrial processes	●		●	●	●	●	●
Paints and preservatives			●	●			
Pesticides			●	●			●
Stormwater facilities	●		●				

Adapted from: Horner et al 1994.

Pollution loading is caused by changes in hydrology, and activities related to urban living. By removing vegetation and replacing it with impervious surfaces runoff increases, natural processes of evapotranspiration and percolation are disrupted, and pollutants are concentrated. Most of the pollutants are delivered to surface waters during the early stages of storm runoff. The time of delivery depends on the storm intensity. Table 4.4C shows typical pollutant loads associated with urban land uses.

Table 4.4C. Typical pollutant loadings (lbs/acre/yr) from urban land uses (highest value in each column is highlighted).

Land Use	Pollutants									
	TSS	TP	TKN	NH_3-N	NO_2-N	BOD	COD	Pb	Zn	Cu
Commercial	1,000	1.5	6.7	1.9	3.1	62	420	2.7	2.1	0.4
Parking lot	400	0.7	5.1	2	2.9	47	270	0.8	0.8	0.04
High-density residential	420	1	4.2	0.8	2	27	170	0.8	0.7	0.03
Medium-density residential	190	0.5	2.5	0.5	1.4	13	72	0.2	0.2	0.14
Low-density residential	10	0.04	0.03	0.02	0.1	na	na	0.01	0.04	0.01
Freeway	880	0.9	7.9	1.5	4.2	na	na	4.5	2.1	0.37
Industrial	860	1.3	3.8	0.2	1.3	na	na	2.4	7.3	0.5
Parking lot	3	0.03	1.5	na	0.3	na	2	0.005	na	na
Construction	60,000	80	na	na	na	na	na	na	na	na

Adapted from: Horner et al 1994.

- *Agricultural activities:*

Most of the upland areas in the Santa Maria Valley that are used to grow annual crops were converted from range use in the recent past. Many of the land use conversions are on slopes that require some form of structural devices, or special erosion control practices to prevent erosion. These practices have not been installed on many of the parcels – probably because they are rented for relatively short terms, which is a disincentive for growers to invest in the necessary improvements. In addition to the erosion potential and the resultant off-site transport of sediment, there is also a probability that there are accelerated chemical losses to the surface waters because of unfiltered runoff.

In precision-leveled farming areas, many of the drain ditches are incised with steep side slopes – probably to maximize the land available for farming. Most of the side slopes are less than 1:1, and many are nearly vertical. A product of this type of construction is frequent bank slumping during wet weather and high sediment loading in the watercourses. Tailwater from gravity flow systems is also relatively high in nitrate content. Measurements taken over a nine month period from Orcutt Creek and Oso Flaco Creek indicated that nitrate content ranges were 140-180 ppm and 120-280 ppm, respectively.

Comments:

(1) The extent of the contribution of urban runoff to the non-point pollution load is difficult to determine. The greater Santa Maria area is by far the most urbanized part of the watershed. The water conveyance system for flood control is very complex involving numerous diversions, storm water surge control basins, sediment collection basins and percolation basins. Each kind of facility has a unique function and maintenance requirement. By ordinance, all developers must provide adequate storm water controls as determined by the Santa Barbara

County Flood Control District (FCD), or provide fees to provide the necessary controls.

Many of the surge basins are used for recreational purposes during the summer and are maintained by the Home Owner Associations, or a public entity. The larger sediment control and percolation basins are maintained by the FCD. Most of the sites have some vegetation that help filter contaminants.

(2) Correcting the erosion in steep sided drainage ditches may not be economically feasible because of the high cost of prime farmland ($12-18,000 per acre). To adequately address the erosion concern the banks would have to be shaped at least at 2:1 and preferably vegetated. This would require dedication of four feet of land for each vertical foot of depth, in addition to the width of the invert.

(3) Much of the developed upland used to grow annual crops is rented. It appears that tenants apply minimal soil erosion control practices because of the associated costs. Since leases are relatively temporary, the cost recovery period might not be available because of lease terms. Landowner participation in applying erosion control practices on rented land also appears to be minimal. Due to the lack of land treatment, sediment removal from water conveyance systems is frequently required. In extreme cases, the utility of the land is lost or severely compromised because of excessive erosion resulting in major land reshaping or abandonment of the worst areas. Sediment transport sometimes affects downstream properties to the extent that expensive land reclamation is required and water conveyance systems have to be rebuilt.

(4) One of the beneficial uses listed by the RWQCB for Oso Flaco Creek is municipal. The nitrate content consistently exceeded thresholds established for human consumption. The maximum level of nitrite plus nitrate that is recommended for livestock watering is 100 mg/l. Although there are no domestic livestock believed to use either Oso Flaco Creek or the dune lakes as watering sources, the area has a substantial wildlife population, including deer. It is unknown if the high nitrogen content has any deleterious effect on mammals or birds. Historically cattle have had access to Orcutt Creek and there are no reports of problems related to nitrate; however, the nitrate levels sampled in Orcutt Creek were approximately one-half the levels in Oso Flaco Creek.

High nitrate content in tailwater can be reduced by implementing on-farm fertilizer management plans. Some of the problem may be corrected as irrigation systems are converted from traditional sprinkler/furrow to sprinkler/drip tape. Vegetable transplants and drip irrigation appears to be a growing trend in Santa Maria Valley.

4.5 Surface Waters - Lake and Ponds:

4.5.1 Twitchell Reservoir*:*

As stated previously, the reservoir is operated as a water conservation and flood control facility. Since construction in the late 1950s sediment has been accumulating at an average of approximately 1,200 acre-feet per year, over twice the rate predicted by the Bureau of Reclamation (Twitchell Reservoir Sediment Management Plan, WA, 2000). Approximately 92 percent of the sediment accumulation is located within the water conservation pool resulting in a loss of about 26 percent of the conservation pool capacity. This accumulation has had a major effect of the continued operation of the dam because it inhibits full control and operation of the primary outlet that controls water releases. If sediment continues to accumulate, the primary outlet could become inoperative. All water will then discharge through the emergency spillway after the dam fills. This will severely compromise the flood control function, and the additional groundwater recharge of the Santa Maria basin facilitated through controlled summer releases will be lost.

The additional groundwater recharge capability because of the controlled releases was estimated to average approximately 20,000 acre-feet when the reservoir was completed, so presumably some of this capability has already been lost because of the sediment. This recharge is critical in maintaining salt balance in the groundwater basin. Estimates of overdraft of the groundwater basin range from none to 20,000 acre-feet, so no matter which study is used, it is obvious there would be a significant overdraft if the primary outlet becomes inoperative.

As part of a proposed sediment management plan, sediment core samples were taken from seven locations between the upstream face of the dam and the Huasna River. Almost all of the sediment near the water release control, which is located near the dam, is high plasticity clay. The clay layer gradually decreases upstream with coarse material appearing at the upper reaches. The sampling included analyses for heavy metals, petroleum hydrocarbons, volatile and semi-volatile organic compounds and pesticides. None of the sample tests revealed any element or compound that exceeded regulatory thresholds.

4.5.2 Dune Lakes complex: There is little published information available concerning water quality of the Oso Flaco Lake system except for various anecdotal accounts that allude to nutrients and pesticides being introduced from agricultural runoff. “The Natural Resources of the Nipomo Dunes and Wetlands” (CA Dept. of Fish and Game, 1976) describes water quality issues as follows: “The Oso Flaco lakes receive a continuous flow of irrigation tailwater during dry periods. This type of water may contain large amounts of nutrients in the form of fertilizers as well as pesticides that are potentially hazardous to wildlife. Little Oso Flaco, smallest of the two lakes, has the greatest water quality problem; much of the surface water is covered by algae in summer. The larger Oso Flaco

Lake, because of its size and depth, appears to be less affected by the nutrient-rich irrigation discharge it receives. In recent years, however, a marked increase in algal growth has been observed in the lake. Two small lakes in the Oso Flaco vicinity, Jack Lake and Coreopsis Lake, receive no tailwater. Although little is known about them there are no apparent water quality problems related to human use and development."

Numerous senior project papers concerning resources of the lake have been prepared by California Polytechnic State University students. Most also address water quality issues in anecdotal form. However, one student did make direct measurements for specific chemicals. In this paper, "Nitrate and Chlorpyritos Analysis of Oso Flaco Lake" (Allen, 1994), measurements of Dursban *(Chlorpyritos)* and nitrate were completed. Dursban is stated as a pesticide of choice for broccoli crops that are common to the area. The measured nitrate level was 30 ppm.

As part of this project, water-samples were tested by the RCD monthly from May 1999 through January 2000 (Table 4.5.2). The sites included Oso Flaco Creek at Oso Flaco Road and at the causeway separating Little Oso Flaco Lake from the larger Oso Flaco Lake. During the measurement period, all of the runoff in Oso Flaco Creek was irrigation tail water from surface flow systems, or flows from sub-surface tile drains. (Many of the parcels in this area are artificially drained because of a perched high water table.)

Table 4.5.2. Water Quality Samples – Oso Flaco Creek and Lake.

Site	Date	pH	EC (mmhos/cm)	NO_3 (ppm)	Hardness (ppm)
Oso Flaco Ck @ Oso Flaco Rd.	07-May-99	6.0	1.7	120	672
	10-Jun-99	6.6	1.6	120	800
	14-Jul-99	6.0	1.6	120	704
	10-Aug-99	7.2	1.7	110	768
	16-Sep-99	7.4	2.0	200	1000
	18-Oct-99	7.6	2.5	120	850
	15-Nov-99	7.6	2.6	200	1200
	16-Dec-99	7.1	1.8	280	1056
	19-Jan-00	6.8	2.0	150	1100
Oso Flaco Lake @ Causeway	07-May-99	6.0	2.0	140	864
	10-Jun-99	6.7	1.9	130	850
	14-Jul-99	6.2	1.8	80	768
	10-Aug-99	7.2	1.8	90	800
	16-Sep-99	7.4	1.8	81	900
	18-Oct-99	7.6	2.0	96	1000
	15-Nov-99	7.6	2.0	120	1000
	16-Dec-99	7.1	2.0	150	928
	19-Jan-00	7.0	1.6	94	800

4.5.3 Other lakes and ponds:

No water quality information is available for Bradley Lake or the Betteravia Lakes. Most of the watershed above Bradley Lake is farmed. Much of the area was also mined for oil so any contamination would likely be the result of practices associated with these industries. The Betteravia Lakes include runoff from agriculture, urban sources and the Santa Maria Airport. The watershed drainage is very complex and includes a series of floodwater retarding and percolation basins. Some water is also diverted through a pipeline from Orcutt Creek. The source of any contaminants, if any, would be difficult to determine.

Some of the ranches have constructed ponds that provide water for livestock and wildlife. The ponds are usually relatively small (<10 acre-feet), and they usually go dry by late summer because of water consumption and evaporation. All are designed to store surface water runoff, and most, if not all, allow free access by livestock. There are several concerns with free access by livestock including destruction of riparian cover, increased turbidity and sediment loading. However, the biggest concern is the introduction of pathogens through defecation into the water supply, particularly drinking water sources and water contact recreation.

Summary:

(1) Several alternatives to address the sediment concern are presented to mitigate the sediment concerns of Twitchell Dam. These alternatives include various flushing methods, mechanical removal and upstream erosion control. The method of sediment removal has not been adopted at this time, nor has a source of funding been located. Regardless of the alternative selected, there will be major environmental issues that must be addressed.

Ideally, land treatment to reduce soil erosion in the upstream areas would help to mitigate the concern. However, that would be a difficult and extremely expensive task because of multiple land ownership, highly erosive soil types, unstable geologic features, institutional and environmental issues.

Most of the mountain range on the north side of Cuyama Valley is unstable and very erosive. The soils in most of that area are derived from Miocene-era marine deposits, and are highly erosive because of the fine texture, very steep topography and depth to bedrock. Compounding the problem is a lack of ground cover. This region is very arid with an average annual rainfall is less than 10 inches, and much of the rainfall comes in short duration, high intensity storms. In between rainfall events there are extended drought periods. In the summer months, temperatures around 100^0 F are common along with low humidity. These conditions create an environment that will only support highly specialized drought resistant plant species. Most of the deep-rooted plants are widely spaced because of the competition for moisture, so they have limited effectiveness in providing erosion control. Annual grasses and forbs, which are dominant in the open areas, are also more limited in providing erosion control than the coastal areas. They typically do not germinate until late in the season and they are slow growing in the winter months because of temperature inversions that are commonly below freezing.

The erosive properties of the uplands are clearly demonstrated by the frequent road closures of Highways 166 and 33 because of sediment deposition on the roadways. The exact amount of which eventually is transported to Twitchell Dam is unknown, but it is substantial. Much of the sediment is a product of erosion from public land. Control of erosion in these areas would be difficult because of institutional constraints, environmental issues and costs. (The entire Cuyama Valley is designated as habitat for a number of burrowing animals so obtaining permits for any channel work would be difficult.) On private land that is primarily used for grazing, there would be little incentive to install costly erosion control devices because of the relatively low land values. Erosion on the more productive farmlands is a non-issue. Almost all of the farming is done on flat, or nearly flat, land. When erosion or sediment control devices are required in those areas it is primarily associated with flows generated in native upstream areas.

In addition to the erosion in the uplands, most of the mainstem of the Cuyama River is actively eroding. Almost every outside river meander within the valley is in an active state of erosion. Many of the eroding banks are nearly vertical, and relatively high (> 20 feet), so they would require some sort of mechanical device to be stabilized. The exception to high banks is from about the Highway 166 river crossing east of New Cuyama to the Ventucopa region. In that area, the banks are very low averaging only about three or four feet in height. Nonetheless, this region is also highly erosive and subject to erosion from meander bouncing.

The south-to-north tributaries from the Sierra Madre Range, unlike the opposite side of the valley, are reasonably stable geologically. The parent material in most of that area is derived from Pliocene non-marine deposits, and the depth to bedrock is relatively shallow. In addition, there is a much higher amount of precipitation and a proportionately greater amount of vegetation. Some of the precipitation is usually in the form of snow that also helps to meter the runoff and reduce the soil erosion potential. However, with the increased vegetation, the risk of wildfire also increases, and two major wildfires have occurred within the past five years. Approximately 64,000 acres burned, all of which was within this project area. USFS burn reports indicate that 27,084 acres in the wildfire areas had a soil erosion hazard rating of moderate to very high during the recovery period. The larger of the wildfires, Logan, was estimated to require a five-year vegetative recovery period. The other (Spanish) was estimated to require a ten-year recovery.

(2) While sediment accumulation in Twitchell Dam is a major concern because of the loss of water supply for the Santa Maria Valley, this loss of sediment may have a long-term effect on the beach dunes. The river plays a major role in beach and dune maintenance by delivering sediment and depositing it in off shore bars during the rainy season. In summer, the sediment is washed onshore

to nourish the beaches. Strong northwesterly winds during the season blow inland and transport some of the material on the inland dunes. Although sediment is trapped under the existing method of operation, a substantial amount is passed through because of a requirement to maintain storage in the flood control pool during winter runoff. Some sediment is also released in regulated flows during the summer months. If the primary spillway becomes inoperative then the sediment retention capacity will increase, further reducing transport to the ocean.

(3) Highway 166 was first relocated to accommodate construction of the dam. Then several years later more of the road was relocated from an upland area to the Cuyama River gorge west of Cuyama Valley. In the process, approximately 7,300 feet of river meanders were removed in a reach of approximately 82,500 feet resulting in an 8.8 percent shortening of the watercourse in that reach. This undoubtedly increased soil erosion because of the increase in stream velocities and flow concentration. The channel might also have been incised east of that point and contributed to the existing bank erosion problems that occur throughout the western end of Cuyama Valley. No records are available to determine the volume of material that was the product off any of the road relocations.

(4) The impounded area of Oso Flaco Lake is determined by a constructed channel that outlets to the ocean. During the first four months of the sampling period, the outlet was closed by drifting sand. This caused the lake to rise and flood over the causeway. It was eventually cleared and, the lake returned to the historic static level in September. During the high water period, the measured attributes at both the creek and lake were similar. However, during the remaining sample period the creek site had consistently higher nitrate levels than the lake. It also shows that the profuse vegetation in the upper lake assimilates approximately one-third of the nitrate, and supports observations by the F&G that elevated nutrient levels are responsible for accelerated plant growth in the lakes.

(5) Water borne pathogens related to livestock production do not appear to be a problem in this watershed. There are no recorded incidences of contamination in the public water supplies. However, it might be prudent to check rural domestic wells periodically if they are in close proximity to areas that have high levels of livestock use. In general, there is no water contact recreation in the watershed except for the ocean, or remote mountain streams. Twitchell Reservoir has adequate water storage on occasion to support water contact recreation, but it is not a permissible activity.

4.6 Estuaries:

There is limited information concerning water quality in the Santa Maria River estuary. However, the RWQCB is in the process of implementing a monitoring program for the Santa Maria River watershed, including the estuary, and commencing in 2000. Other activities in progress include a bio-assessment and sediment chemistry sampling. This work is being conducted by the CA Department of Fish and Game (F&G).

High toxicity was found in the estuary in a single sampling conducted by the F&G in 1998 as part of the Bay Protection and Toxic Cleanup Program (Karen Worcester, RWQCB – personal communications). In that sample, it was determined that the estuary had the highest DDT value in RWQCB Region 3, and the only one that exceeded the organic carbon normalized guideline. Dieldrin, an organochlorine compound, and nickel were also noted to exceed the guidelines. No determination was made as to the source.

Surface water contamination may also result from hydrocarbons in groundwater discharges to the river (Little, 1998). These hydrocarbons are a product of oil industry related actions in the dune areas. The concern is addressed in a mitigation plan prepared by UNOCAL that is in the implementation stage.

As part of this project, water samples were taken monthly from Orcutt Creek and the estuary from May 1999 through January 2000. The samples were evaluated for nitrate content, pH, salinity and hardness (Table 4.6). All of the flows were from irrigation tail water. The Orcutt Creek samples were taken at the bridge crossing near the end of West Main Street. The estuary measurements were taken northeast of the beach parking lot.

Table 4.6. Water Quality Samples – Orcutt Creek and Estuary.

Site	Date	pH	EC (mmhos/cm)	NO3 (ppm)	Hardness (ppm)
Orcutt Creek @ West Main	07-May-99	6.0	2.6	160	1080
	10-Jun-99	6.7	2.6	170	1100
	14-Jul-99	6.2	2.6	130	1024
	10-Aug-99	6.2	2.6	140	1248
	16-Sep-99	7.1	2.4	140	1006
	18-Oct-99	7.8	3.0	180	1400
	15-Nov-99	7.4	2.9	180	1500
	16-Dec-99	7.0	2.2	150	1088
	19-Jan-00	7.1	2.4	140	1200
Estuary	07-May-99	6.2	2.6	150	1128
	10-Jun-99	6.9	2.4	120	1100
	14-Jul-99	6.0	2.6	120	1216
	10-Aug-99	6.8	2.5	120	1216
	16-Sep-99	7.1	2.4	120	1250
	18-Oct-99	7.6	2.8	150	1250
	15-Nov-99	7.2	2.8	140	1400
	16-Dec-99	6.9	2.2	130	1152
	19-Jan-00	7.4	2.3	100	1200

4.7 Conclusions:

It is apparent that the most critical pollution concerns in this project area are the two groundwater basins. Most of the pollutants are associated with non-point sources, the bulk of which are products of agricultural activities. However, urban and industrial activities and natural sources also contribute to the problem. Both basins have immediate concerns with nitrate contamination, and increasing salt loads are resulting in increased salinity. In the absence of a comprehensive chemical management plan, the increasing salinity will require growers to increase leaching fractions to maintain productivity, or change crops selections to species with greater salt tolerance. By increasing leaching fractions, water quality degradation will accelerate due to the greater pumping requirements and increased opportunity for evaporation resulting in increased surface salts.

Water quality information for lakes and ponds in the project area is limited. However, based on the assessment of the Oso Flaco Lakes it is likely that Bradley Lake and the Betteravia Lakes probably have elevated nitrate and TDS levels because the incoming waters are largely draining from intensively farmed areas. Stock water ponds and some streams may have excessive contaminants, particularly pathogens from animal fecal matter. Most of these water sources become dry, or nearly so as the summer season progresses so the level of contamination would be particularly acute at that time of the year.

It appears from the measurements taken from selected sub-watersheds within Santa Maria Valley that most of the drainage ways within the valley would have elevated levels of contamination because of the intensive land uses. Conversely, there does not appear to be any significant pollutant sources in rural area streams. However, there is little information concerning rural water quality so there may be some streams that are above the standards established for certain beneficial uses. The rural regions are primarily used for grazing cattle or recreation so specific sites may have elevated levels of contaminants because of cattle operations, or irresponsible activities by people pursuing recreational activities.

Section 5 - WATER QUALITY MANAGEMENT STRATEGIES

5.1 Overview:

Nonpoint pollution influences on water quality can be from human activities, or natural sources. Individually these sources may be insignificant, but collectively they build upon each other. The scattered sources throughout the watershed are collected and combined in storm waters, delivered downstream and concentrated. In this watershed, the ultimate repository for pollutants may be the ocean during periods of high flows. However, both major groundwater basins have pervious overburden throughout most of the area so some pollutants are delivered to groundwater before reaching the ocean.

The two major groundwater basins in this project area are also affected by return flows to the aquifers that deliver chemicals resulting from a variety of human activities. These activities include farming and farm related industries, urban and industrial sources, transportation systems and oil mining.

Some forms of pollutants, such as sediment, may drop out of suspension and affect storm water conveyances, damage property, destroy wetlands, kill benthic organisms, and alter native plant communities. Some soil erosion and the resultant sediment product is a natural part of a healthy hydrologic system, however, induced or unnatural sediment can upset the balance.

In order to assess the many contributing sources of nonpoint pollution and develop management strategies, the planning area was segregated and analyzed based on nine land use categories. Five of these categories represent various forms of agricultural use.

- *Agriculture, Irrigated annual upland crops*
- *Agriculture, Irrigated leveled annual crops*
- *Agriculture, Irrigated perennial crops*
- *Agriculture, Range land*
- *Agriculture, Dry farmed annual crops*
- *Mined land*
- *Public land (federal management)*
- *Urban land*
- *Rural residential*

Most land use planners and permitting agencies in the affected counties use land use maps furnished by the CA Department of Conservation (DOC) Farmland Mapping and Monitoring Program and the USDA soil surveys.

The use categories for this project are similar to, but not consistent with, current mapping criteria used by the DOC. The most recent DOC maps for this region are dated 1996. They also use five categories of agricultural land: Prime Farmland, Farmland of Statewide Importance, Unique Farmland, Farmland of

Local Importance, Grazing Land. Other land designations used are : Urban, Water, and Other. A detailed explanation of the various map categories is available in "A Guide to the Farmland Mapping and Monitoring Program, 1992, from the Department of Conservation, Office of Land Conservation, Publication Number FM-92-01.

Inclusion into the various DOC farmland use categories is largely dependent on economic values and the USDA Soil Surveys rather than cultural requirements associated with the production of the various commodities. There are two surveys of the private lands in the planning area - Northern Santa Barbara Area and San Luis Obispo County Coastal Part.

The soil surveys provide soil capability groupings that show, in a general way, the limitations of soils. They took into account land forming or other reclamation practices, such as sub-surface drain lines, that improve the utility. (The Santa Barbara County survey fieldwork was completed in the 1960's. Numerous agricultural parcels have been modified since the survey was published. Those areas would require a field review to upgrade the land class.)

The USDA uses eight land designations to approximate the limitations of the various soils. The classification ranges from Class I, which has little or no limitation to Class VIII that has severe limitations. Capability Classes II through VIII are also divided into four sub-classes to further define the reason for the limitation. The sub-categories include risk of erosion, wetness, inherent soil problems and climatic factors. A tertiary rating further defines the sub-class concern. (There are some differences in the published land classification system of the respective surveys because of the criteria used when they were published. Refer to the soils discussion in section 2.7 for information concerning these differences.)

5.2 Land use definitions and trends:

5.2.1 Agriculture, Upland irrigated annual crops:

DEFINITION: For the purposes of this plan, irrigated upland annual crops are commodities produced in less than one year on land with topographic features that precludes the use of gravity flow (furrow) irrigation systems. Slope and soil texture may also dictate special treatment requirements for erosion control, or there may be other concerns that must be addressed for full utility of the land. In most cases, these lands are defined as Class III and IV in USDA soil surveys, and as Farmland of Statewide Importance in the DOC classification system. Crops included in this category include various vegetables, strawberries, and specialty crops such as flowers.

TREND: Almost all of the land in the watershed that is level, or nearly so, was developed many years ago. As a result, all increases in irrigated annual crop acreage are in upland areas that are primarily used for grazing beef cattle. During the mid-1980's, there was substantial growth in the strawberry industry in the Santa Maria Valley. Since then, the industry has regressed slightly. About the same time, there was also an expansion of the vegetable industry into these upland areas, and it appears to be increasing substantially. In recent years, a new flower industry has been started, and it to appears to be growing. Almost all of the expansion in Santa Maria Valley area is between Santa Maria and the Garey/Sisquoc region.

Simultaneous with the expansion of upland annual plantings in the coastal area, there was a crop type conversion occurring in the Cuyama Valley. Up to the mid-1980s about 75% of the acreage was devoted to growing alfalfa. Since then the inverse has happened with over 85% of the acreage now devoted to other crops, including annuals. In addition to the crop type conversion, there has been a substantial increase in farmed land, most of which is an expansion into land previously used for range. All of the farm growth has been in the eastern end of the Valley because of the limited water supplies in the western part.

5.2.2 Agriculture, Leveled irrigated annual crops:

DEFINITION: In this plan, irrigated annual crops (leveled) are defined as those commodities that are produced on land that has been precision shaped to a gradient that provides optimum distribution uniformity of water and nutrients. There are few, if any, limitations. In some parts of western Santa Maria Valley, a perched high water table has been artificially drained to provide full utility of the soil. Most of these parcels are farmed year-round and at least two vegetable crops are produced annually on each parcel. However, some of the parcels are used for growing specialty crops such as strawberries or flowers, and may only produce one crop annually because of the length and timing of the growing season. There is a direct correlation with the DOC mapping and definition of “Prime Farmland”. The NRCS soil surveys define the soils as Class I. In this document, some parcels identified as Class II are also included because of existing modifications such as land leveling, or installation of tile drains to lower high water tables.

TREND: As stated previously, almost all of the available level land has been appropriated for some purpose so there is no opportunity for growth. However, because of improved irrigation and agronomic technology, growers have been producing more crops by reducing the intervals between crops. Most of this increase in production has been attributed to the use of vegetable nursery transplants to shorten the time in the fields.

5.2.3 Agriculture, Irrigated perennial crops:

DEFINITION: Irrigated perennial crops include a variety of commodities, the most common of which is wine grapes. Most of the wine grapes are grown on sloping land in the foothills surrounding Santa Maria Valley east of Highway 101, and more recently in Cuyama Valley. Some coastal areas are also used to grow avocados and lemons because of favorable microclimates. In Cuyama Valley, a variety of deciduous fruits and nuts grown. The principal fruit is apples, and the primary nut crop is pistachio.

Almost all of the land used for perennial crops is on varying degrees of slope and equally diverse soil conditions. The exception to this is the Cuyama Valley where almost all are grown on land that is relatively flat, and the soil conditions are more uniform. The DOC defines the perennial crops as either "Farmland of Statewide Importance" or "Unique Farmland" depending on the soil and/or the slope. Some of the perennial crops are grown on soils classified by the NRCS as Class I; however, most of the plantings are on relatively steep land up to, and including, Class VII soils.

TREND: In recent years, there has been exponential growth in the wine grape industry, and it appears that this growth will continue. Much of the growth is in the area around Santa Maria Valley where there is a favorable climate and available groundwater. However, the industry is also expanding in other regions within the planning area, including Cuyama Valley. Almost all of the growth except in the Cuyama region is on rangeland or on fields that were formerly used for dry farming grain. In Cuyama, some of the growth has been on land that was used to grow other irrigated crops. Cuyama Valley also experienced substantial growth in fruit crops earlier this decade. That rapid expansion has slowed considerably, but some conversion is expected to continue.

5.2.4 Agriculture, Rangeland:

DEFINITION: For the purposes of this plan, rangeland is that area that annually produces forage without any cultural practices being employed. On some farms and ranches, livestock is sometimes grazed on crop residues within cultivated fields. Those fields were considered as farmed land in this plan. Most of the private rangeland is used for beef cattle production. Almost all of the forage plants are introduced grasses and broad leaf annuals from the Mediterranean region.

TREND: According to Agricultural Commissioner's reports, there has been a steady decline in cattle production for the past 20 years. Some of this decline could be attributed to unfavorable climate in some years, unfavorable markets, or land use conversions to more intense uses. It appears that this trend will continue because of the apparent demand for land with an expanding irrigated farming industry. In most cases the land conversion is on the most productive range sites, so the carrying capacity is reduced at a disproportionate ratio relative to the gross rangeland acreage.

5.2.5 Agriculture, Dry farmed crops:

DEFINITION: In this plan, dry farmed crops are those crops that are primarily raised without the benefit of irrigation. In some cases minor amounts of supplemental water may be supplied through irrigation. Most of the dry farmed crops are cereal grains, beans, Sudan grass and safflower.

TREND: Dry farmed cropping has been in decline for the past decade, and this decline is expected to continue in all areas that have groundwater sources that can be developed in quantities that are sufficient for irrigated crops. Throughout this watershed, there is an intense demand for land to grow wine grapes and vegetables. This demand has escalated land values to a point that owners will likely sell, or lease, their properties if they are unwilling, or unable, to fully develop it independently.

5.2.6 Mined Land:

DESCRIPTION: Most of the mining in this area involves oil and natural gas, and gravel mining. Most of the oil production is located in the general areas around Santa Maria Valley and in Cuyama Valley. Almost all of the sand and gravel mining is in the Sisquoc River near Garey, and in the Cuyama River near Ventucopa.

TREND: Oil mining is declining throughout the area; whereas, the sand and gravel operations appear to be stable.

5.2.7 Public Land (federal management):

DEFINITION: The principal federal land management agencies in the watershed are the USDI-Bureau of Land Management (BLM) and the USDA-Forest Service (USFS). For the purposes of this project, other publicly owned lands are not listed as distinct categories because the parcels are relatively modest in size. The exception is the Guadalupe dunes area. Much of that land is under State agency management; however, there are specific plans already developed, or in the process, that will address the issues of concern in this project. Other public land, such as City and County recreational areas are included under the urban category.

Bureau of Land Management: All of the BLM land in this watershed is included in the Caliente Resource Planning Area. Within this area, there are three separate management units: Coast, Valley, and South Sierra. The Santa Maria River project area includes parts of the Coast and Valley regions.

The largest contiguous BLM parcel in this project area is the south slope of the Caliente Mountain Range located on the north side of Cuyama Valley. This parcel is managed as part of a much greater area collectively known as the Carrizo Plain Natural Area, and is included in the Valley management region. There are numerous other parcels scattered throughout the watershed that are also managed by the BLM. Most are within the Coast management region. These parcels range form 40 acres to approximately 5,500 acres, the largest of which is also located in the Caliente Mountain Range; however, it is a segregated parcel.

Forest Service: All of the land in this project area under USFS jurisdiction is within the Los Padres National Forest (LPNF). Two ranger districts serve the area. The Santa Lucia Ranger District includes all USFS land in the Sisquoc River, Huasna, and Alamo Creek drainage basins. It also includes that part of the Cuyama River basin that is west of McPherson Peak. (McPherson Peak is located in the Sierra Madre Mountain range about eight miles southwest of New Cuyama.) All of the USFS land in the Cuyama River basin east of McPherson Peak is managed by the Mount Pinos Ranger District.

Most of the USFS land is located in the Sierra Madre and San Rafael Mountain ranges. It includes the Dick Smith and San Rafael Wilderness areas. The two wilderness areas cover approximately 75 percent of the Sisquoc River drainage basin. The river is also designated as a "Wild and Scenic River" for that reach that is within the national forest.

TREND: *Bureau of Land Management:* Land in this watershed that is under the management of the BLM will decline when the current BLM plan is implemented. Properties that do not fit an active Bureau program will be repositioned. Depending on the location, the repositioning will be accomplished by transfer to the USFS, or to counties, land trusts, or non-profit organizations. Isolated parcels would be targeted for land exchange when feasible, or sold.

Forest Service: The amount of land under the jurisdiction of the USFS will likely remain relatively unchanged. Certain BLM land will be transferred to the USFS, and a goal of the USFS is to acquire private land to consolidate federal holdings. Either action would increase USFS land. However, the USFS plan also includes disposal of land whose retention does not benefit the public interest. The property acquisitions to consolidate USFS land holdings would be through land purchase from willing sellers, or land exchange. Land exchange could be out of this project area, thus reducing the overall holdings.

5.2.8 Urban Land:

DEFINITION: For the purposes of this project, urban land includes residential, commercial and industrial properties as defined in the State Department of Water Resources "Standard Land Use Legend". Mapping of such lands was taken from a land use survey completed by the DWR in 1995, and updated by the RCD. This survey includes urban landscape such as cemeteries and golf courses. It also includes open lands that are used or designated for urban use such as parking lots and flood control channels.

TREND: The Santa Barbara County Association of Governments "Regional Growth Forecast 94" predicts that the population in Santa Barbara County will increase by approximately 110,000 by 2015. Much of this growth is forecast for the Santa Maria Valley, with a concentration of growth in the Santa Maria area.

Similar growth is expected in the greater Nipomo area of San Luis Obispo County.

Both counties have policies to preserve agriculture as an important contribution to the economy, and to provide open space and conservation areas. Because of these policies, the forecast presumes that there will not be any conversion of agricultural land to urban use. However, land currently in agriculture, but designated residential, was assumed to ultimately become urbanized. It is also acknowledged that there will always be pressure to convert agricultural lands to more intensive uses.

<u>5.2.9 Rural Residential:</u>

DEFINITION: Rural residential includes all properties zoned RR-5, RR-10, RR-15, RR-20, RR-40, RR-100 in the County ordinance. The suffix in the zoning designation is the minimum lot size in acres. All types of agriculture are permitted except dairies, hog ranches, animal feed yards, or animal sales yards. One single family dwelling and one guest house is permitted per legal lot.

TREND: Unknown.

5.3 General Planning Considerations:

The following issues should be considered when there is a change in land use, or a significant change in operations:

- ✓ *Soils:* Soils are probably the single most limiting factor determining land use, particularly with agricultural activities. Most of the soils in the farming areas are derived from ancient alluvium and the textures are not always uniform. In many cases, laminations of impervious material restrict percolation rates. The soil surveys are an excellent guide to determine where such conditions exist; however, an on-site analysis may be required for some areas. An example of on-site assessment requirement would be land that has been precision-leveled or otherwise reshaped since the surveys were published. In some cases, such actions may create extremely variable surface textures by exposing different soil horizons during cut and fill operations. Soil texture, particularly surface texture, is a major consideration in selecting, operating or designing efficient irrigation systems.

  Another concern is the soil chemistry. Soil pH varies considerably throughout the planning area ranging from moderately acidic to very alkaline (pH 5.1 to 9.0). Some regions also have saline soils with EC exceeding 4.0 mmhos/cm. Extreme conditions in either case can limit crop productivity, crop selection, and strongly influence water management and energy costs for leaching fractions.

- ✓ *Topography:* Slope is an obvious consideration for any intensive land use. In general, there is an inverse relationship of soil depth to degree of slope. In some cases, the soil depth to bedrock is very shallow and is insufficient to support most plants. As slope increases management concerns and costs increase. Among the many considerations is erosion control and placement of infrastructure such as roads, and design of irrigation systems because of gravity induced pressures.

- ✓ *Water Quality**:*** Assuming adequate water quantity is available, a critical analysis of the quality should be considered. This is particularly important if the parcel is to be irrigated with low-pressure systems such as drip or micro-sprayers where clogging of emitters is a major concern. Clogging can occur from physical, chemical, or biological sources. Most physical sources can be controlled with filter systems and flushing routines; however, chemical and biological sources may also require chemical controls the degree of which depends on the severity of the problem. Table 5.3 is a general guide concerning plugging hazards based on water chemistry:

Table 5.3 – Plugging Potential of Micro Irrigation Water

All measurements in ppm except EC which is in mmhos/cm

Chemical [1]	Slight Hazard	Moderate Hazard	Severe Hazard
Dissolved solids	<500	501-2000	>2000
Manganese	<0.1	0.2-1.5	>1.5
Iron	<0.1	0.2-1.5	>1.5
Hydrogen sulfide	<0.5	0.6-2.0	>2.0
Hardness[2]	<150	151-300	>300
Salinity[3]	<0.75	0.76-3.0	>3.0

(modified by Pitts,1994 from Nakayama & Bucks, 1986)

[1] This table only applies to water taken directly from a well.

[2] Hardness is a measure of the concentrations of Ca and Mg. If measurements are given as Ca and Mg in ppm or mg/l then the approximate hardness can be calculated thusly: (2.5 x ppm Ca) + (4.1 x ppm Mg). If the measurements are in meq/l they can be converted to ppm or mg/l as follows: Ca meq/l x 20, Mg meq/l x 12.

[3] Salinity is measured as electrical conductivity (EC).

- ✓ *Sensitive Species and Habitats:* There are many sensitive species located throughout the project area, and the habitats they occupy are critical for their survival. The species include plants, reptiles and amphibians, birds, invertebrates and mammals, so it is wise to consult with a qualified biologist, preferably from the regulatory agencies, when considering any major land use changes and certainly before they are implemented. Mitigation requirements for disturbing sensitive species' habitats can be a formidable and expensive task.

Wetlands of all types are considered sensitive, and even modest activities such as the installation of erosion control structures in stream channels can trigger punitive actions by regulators unless the necessary permits are obtained.

5.4 Essential Practices:

Implementation of the following practices will have the greatest effect on reducing the most critical nonpoint sources of pollution, which are increasing salt loads and nitrate contamination of the groundwater systems. Practice EP-01 through EP-04 generally apply to agriculture; however, some elements of each practice also applies to the urban community. Practice EP-05 is specific to turf irrigation in the urban areas.

EP-01 Irrigation System Designs: All irrigation systems should be planned by a competent irrigation system designer. Many of the new irrigation systems that will be employed in this project area will be on sloping land. This can pose problems because of pressure differentials caused by variable gravity heads due to the undulating topography. Pressure differentials are especially important for systems that require low operating pressures such as micro-sprayers or drip. Wine grapes typically require dual systems with different operating pressure requirements. They employ high-pressure, solid-set sprinklers for frost protection and drip systems for crop irrigation. Similarly, most annual crops are grown with dual systems, either sprinkler-furrow systems or sprinkler-drip tape. Each system has specific considerations, including matching of the pumping plants to the conveyance. Retrofitting old systems should be closely checked for hydraulic efficiency, particularly when recycling components for low-pressure systems, or when undergoing a system type conversion.

No irrigation system is 100 percent efficient. Irrigation efficiency is the ability of the system to deliver precise controlled quantities of water for the benefit of the plants. The upward limit of irrigation efficiency is largely determined by the distribution uniformity (DU). As the phrase implies, DU is a measure of how uniformly water is distributed and how well it infiltrates the soil profile. The minimum acceptable industry standards for DU are: Sprinkler and Furrow Systems 75%, Drip and Micro-sprayers 85%.

EP-02 Irrigation System Maintenance: Irrigation evaluations, particularly for older systems, should be encouraged. During the recent past, the RCD has provided irrigation system evaluations through its Mobile Lab program, and the results to date indicate that there is substantial room for improvement. Through December 1999, approximately 600 evaluations were completed. The results are included in Table 5.4. A graphical presentation is shown in Figure 5.4 (page over).

Table 5.4. Summary of Irrigation System Evaluations

System Type	Number Tests	Below Std. DU's (No.)	Mean DU (%)	Potential Water [1] Savings (ac-ft/yr)	Cost ac-ft ($)	Impacted Area (ac)	Energy Cost Savings ($/yr)
Ag Sprinklers	211	137	66	12,693	70	36,838	626,582
Drip	167	112	74	863	98	13,831	125,365
Microsprinklers	104	78	68	843	241	3,687	128,654
Turf	103	94	52	469	601	665	125,414
Furrow	16	9	72	342	30	4,088	5,821
All Systems	601	430	66	15,210	197	59,109	1,011,836

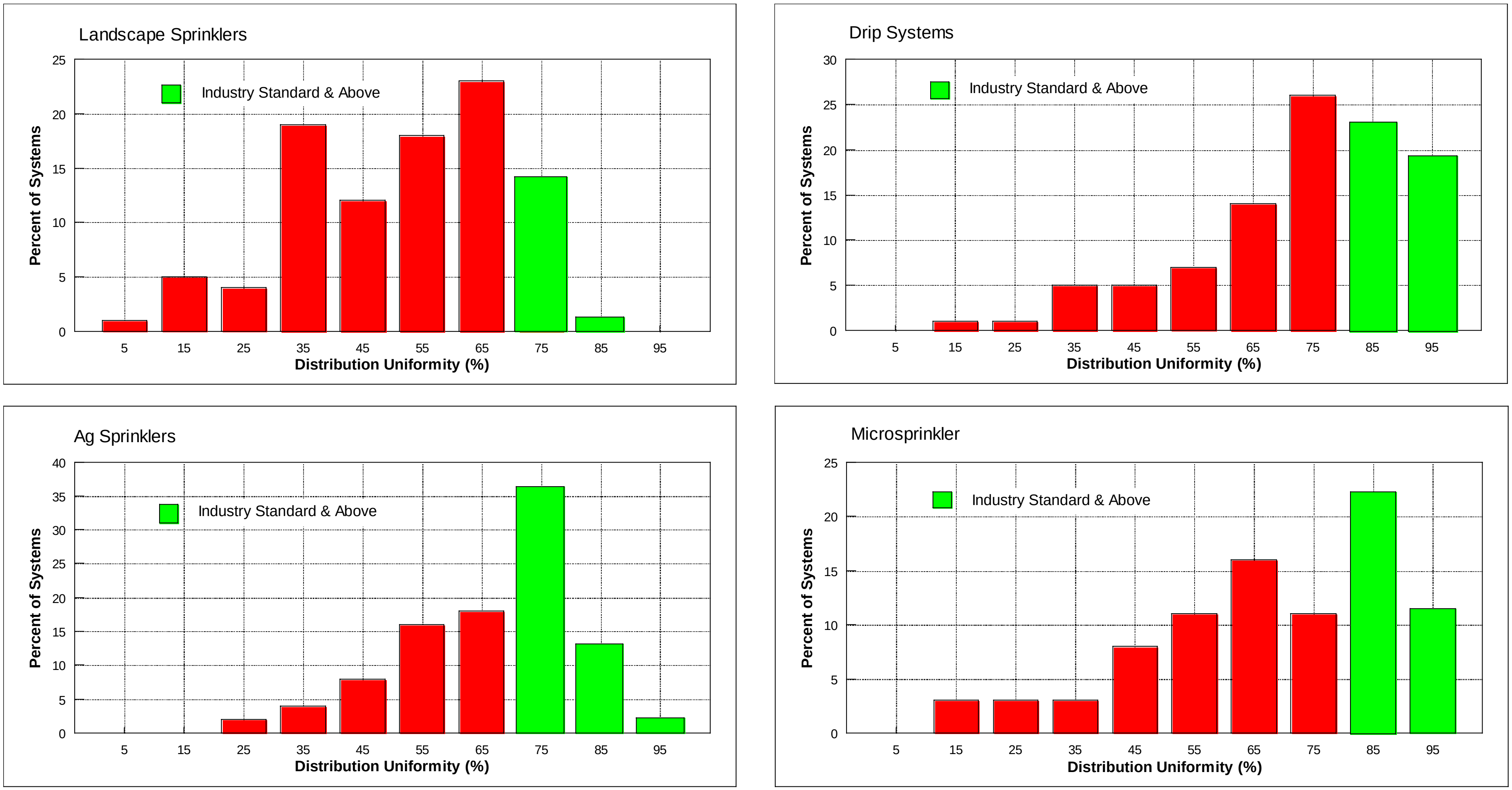
1] Savings are reduced pumping requirements if systems are brought up to industry standard D.U. Assumes that the systems are correctly managed for set times and frequency of irrigation.

Although some of the evaluations indicated significant plumbing problems, the causes of poor DU's were usually relatively easy to correct. Problems typically identified with sprinkler systems were worn nozzles, variable nozzle sizes, uneven spacing, and excessive run lengths. With drip and micro-sprayers typical problems identified were uneven pressures, emitter plugging, inadequate system flushing or filtering, and inadequate water treatment.

EP-03 Irrigation Scheduling: Irrigation scheduling is the duration and frequency of irrigation. Proper scheduling will provide enough water to satisfy the beneficial use requirements while conserving water and improving water quality. Water quality will be improved by reducing the opportunity time for evaporation, and reducing salt transport to aquifers or surface waters. Beneficial uses of irrigation water include evapotranspiration requirements, leaching needs and special cultural practices that may be required.

Factors that must be taken into consideration when scheduling irrigation include the crop type and stage of growth, system type, application rate, soil water holding capacity, leaching fraction, and evapotranspiration rates. Many tools are available, including personal experience. An effective guide is the California Irrigation Management Information System (CIMIS). CIMIS is a network of computerized weather stations located throughout California. Three of the stations are located in the project area, two in Santa Maria Valley and one in Cuyama Valley. A fourth station will be added in the Santa Maria Valley in the near future. Weather data at the stations is continually updated and fed into a central database in Sacramento and converted into reference evapotranspiration (ET_o). The ET_o is based on turf grass transpiration and evaporation requirements. These data may be used directly to determine irrigation requirements for turf grass, alfalfa, and irrigated pastures. Computing evapotranspiration rates for other crops (ET_c) requires the application of a crop coefficient.

Figure 5.4 Frequency Distribution for all Irrigation System Evaluated.



Many coefficients have been developed and are available in U.C. Cooperative Extension publications. The coefficient can also be estimated with a reasonable degree of accuracy by estimating the percent canopy of an immature crop with respect to the mature state. At maturity, most crops will approximate turf grass water requirements (ET_c).

As a courtesy, the RCD provides a telephone recording with daily updates of ET_o from all of the weather stations. The data may be accessed by dialing 928-9344 in the general Santa Maria area, or by dialing toll-free 1-888-246-4728. The same data is also available on the Internet at http//:wwwdla.water.ca.gov/cgi-bin/cimis/cimis/data.

Factors that determine ET such as wind speed, relative humidity, solar radiation and similar measurements may be useful in other ways. For example, they might be used to determine if environmental conditions are favorable or unfavorable for promoting pest outbreaks. Some irrigators also use the raw data to input into software scheduling programs. Access to the central database can be obtained by acquiring a password from the DWR - call 1-800-922-4647. There is no charge for the access, however, a computer and modem is required.

EP-04 Nitrogen Management: Efficient nitrogen management requires a understanding of the nitrogen cycle and involves management of irrigation systems in addition to fertilizer management. The most important measures are to base the amount and timing of the fertilizer on crop needs and to efficiently apply irrigation water to limit leaching. In many cases, part of the crop nitrogen requirement is available in the soil or the groundwater source. Residual nitrate from previous crop fertilizations and the mineralization of crop residue can be significant, particularly in summer and fall seasons.

There is a management labor cost associated with the practice, but there is usually a net saving because of the savings associated with fertilizer costs and application. Implementing this program will require the purchase of field testing meters. These meters range in cost from relatively inexpensive devices employing nitrate colorometric test strips to relatively expensive color spectrometers. In general, all of the measuring devices are within acceptable tolerances when compared to laboratory measurements and they can be calibrated to assure accuracy.
In simple terms, a nitrate management plan has three components; (1) Development of general fertilizer guidelines, (2) Evaluate field specific factors, (3) Monitor nitrogen availability. In abstract, the following are issues of concern under each phase of a management plan:

(1) Developing general fertilizer guidelines:

- ✓ Establish seasonal total N requirements for each type of crop recognizing that Summer-Fall needs are 15-20% less than Winter-Spring requirements.
- ✓ Minimize pre-plant applications.
- ✓ Plan the heaviest applications for the last half of the growing season when the crop needs are the greatest.
- ✓ Optimize the efficiency (increased D.U.) of the irrigation system to target fertilizer.
- ✓ Avoid water run applications with gravity flow systems.

(2) Evaluate field specific factors:

- ✓ Check the water supply for nitrate content. Many of the water sources are relatively high in NO_3-N. This is relatively constant throughout the year in groundwater. If tailwater is recycled, the value will vary. The calculation to quantify nitrogen in water is: ppm NO_3-N x 0.23 = lbs. N per acre-inch. (On an annual basis, this can be significant; for example, an application of three acre-feet at 10 ppm NO_3-N would be equivalent to approximately 82 lbs. N.)
- ✓ Assess the soil for residual nitrate. This is particularly important during the warm seasons because much of the residue from the previous crop will be decomposing and nitrogen will become available from that source. In the warm season, the mineralization can contribute up to 11/2 pounds of N per acre each day.

(3) Monitor N status:

- ✓ Establish a protocol for a sampling grid, method of sampling and frequency of collection. This protocol will include plant tissue testing to ensure nutritional needs of the crop.

Detailed instructions concerning the methodology for establishing a nitrate management program are available from the California Department of Food and Agriculture, Fertilizer Research and Education Program, 1220 N Street, Sacramento, CA 95814. Telephone (916) 653-5340, FAX (916) 653-2407, e-mail: jrfranco@ucdavis.edu. Ask for: “Drip Irrigation and Fertigation Management of Vegetable Crops (T.K. Hartz, 1994), and “Efficient Nitrogen Management for Cool-season Crops” (T.K. Hartz, 1994).

(Numerous successful nitrate management trial plots and commercial applications have been completed in the Central Coast Region under the direction of Timothy Hartz, Vegetable Specialist, U.C. Davis. Many of the trials were completed in the Santa Maria Valley with the assistance of the RCD. Several large growers now have fully subscribed to the concepts and have installed highly efficient fertilizer management programs.)

A comprehensive nitrate management publication entitled "Nitrogen and Water Management for Coastal Cool-Season Vegetables" (University of California Division of agriculture and natural Resources Publication 21581, 1998) is also available: Mail: 6701 San Pablo Avenue, 2nd Floor, Oakland CA 94608-1239; Telephone: 1 (800) 994-8849; FAX: (510) 643-5470; e-mail danrcs@ucdavis.edu. This publication includes a description of the nitrogen cycle in addition to many nitrogen management strategies.

EP-05 Urban Turf Water Management: Turf watering in this area includes both solid set, and hose-end sprinklers. Some of the solid sets have automated sprinkler controls others are manually operated. In either case, the efficiency of the system is dependent on the D.U., and the set time and frequency of irrigation. Based on RCD urban turf evaluations, it can be assumed that many of the household irrigation systems are only operating at 50% D.U., or less. As a result, additional water is applied to compensate for the system performance resulting in an average over irrigation of about 25% (assuming an achievable minimum D.U. of at least 75%).

The most common problems associated with operation of solid set systems are broken or plugged sprinklers, poor placement of sprinklers, mismatched sprinklers, poor system designs, crooked sprinklers, or sunken sprinklers that allow grass to affect the pattern. Most of these conditions can be determined by observation. Plugged sprinklers should be cleaned or replaced. Mismatched sprinklers should be replaced, and the other conditions corrected by realignment, or raising the sprinklers. The most common problems associated with hose end systems are leaks and poor placement of the sprinkler resulting in blockage from trees or watering pavement or the house all of which are easily corrected.

Most of the urban communities are located on soils that are relatively light in texture so they will allow water to infiltrate at a rapid rate. Since the soils are relatively low in clay content, they also have relatively low water holding capacity. This requires lower application rates, but more frequent irrigation. Most of the urban community located south of Betteravia Road is on pure sand. Those areas require that lawn watering may be necessary every two or three days during the warm season. The most efficient way to determine how much water to apply is as follows:

(1) Make corrections to all observed sprinkler deficiencies.

(2) Determine the application rate of the system by placing at least six straight-sided cans on the lawn between the sprinkler heads, or throughout the pattern if a hose end sprinkler is used. Run the sprinklers for 30 minutes then measure the amount of water in each can and determine the average depth for all cans. (This measurement must use the decimal system, or the measurement must be converted to a decimal.) Divide the average measurement by 30 to determine the rate in inches per minute. (If there are significant differences in the can collections, it is likely that there are significant deficiencies in the system – return to Step 1.)

(3) Determine the consumptive use of water (ET_o) since the last irrigation by accessing recorded data from a CIMIS station located nearest the home. The numbers given will be the gross amount of water, in inches, that needs to be replaced to sustain the grass taking all other factors into consideration. The ET_o can be obtained free of charge by calling 928-9344 (local to Santa Maria) or 1-888-246-4728 (out of the Santa Maria local call area.) A recording will provide the ET_o taken from various CIMIS stations in the area. The ET_o is based on the amount of evaporation and transpiration that will occur in a turf grass environment so there are no other conversions required. The ET_o is updated daily by the RCD. Residents in the Guadalupe area should use Station 120. In the Santa Maria, Orcutt, and Nipomo area use Station 38. In Cuyama use Station 88.

(4) Sum the daily ET_o derived from CIMIS then divide the total by 0.70 to determine how much water needs to be applied.

(5) In step (2) a determination was made to determine the system output in inches per minute. Divide that number into the number obtained in step (4). This equation will determine the amount of water that has to be applied to replace the water lost to ET and it will also account for an assumed 70% D.U. of the irrigation system.

<u>For example</u>:

- In step (2), it was determined that the system was discharging at a rate of 0.6 inches in 30 minutes. This was the divided by 30 to determine that the rate per minute was 0.02 inches.
- In step 3, it was determined that the July ET_o for three days following the last irrigation was 0.22, 0.23 and 0.16.
- In step (4), the daily ET_o for three days was summed for a total 0.61 inches for the period. This total was divided by 0.70 to determine that a gross water requirement of 0.87 inches was required.
- In step (5), 0.87 was divided by 0.02 to determine that the irrigation system should run for 44 minutes.

5.5 Published Standard Practices:

Many of the practices suggested in this section have already been adopted. The reason all practices are listed is to improve public perception of conservation issues. Some of the recommended practices are new and innovative, or are used in other areas but are not generally applied in this region. Most, if not all of the practices, would provide an economic benefit. However, in some cases the principal beneficiary may be the public or a downstream landowner. Under any circumstance, the application of any of the practices will provide for the long-term health of the watershed.

Most of the practices are described in detail in the NRCS Technical Guides. The Technical Guides are formatted to provide a standard to which a practice applies, a specification guide and a construction requirement, if applicable. These are only guides and have to be adapted to site conditions, but they are valuable sources of information concerning issues that must be considered for each practice. Copies are available for review in any NRCS office, including the local Santa Maria and Templeton offices. Copies may also be purchased from the U.S Government Printing Office. They are also available on the Internet at *www.nrcs.usda.com.*

Practices that were abstracted from the NRCS Technical Guide have a parenthesized number that is the control number from the guide. Other practice sources will have a reference, if available.

In most cases, individual practices will provide multiple benefits. For example, a vegetated buffer strip would reduce sediment transport to watercourses and serve as a biological filter for reducing nutrient transport.

AGRONOMIC PRACTICES -

AG-01 Crop Rotation (328): Consists of periodically changing the type of annual crops grown on a specific field. This practice is universally applied by growers. It is the most simple, yet in all probability, the most effective practice that can be employed to reduce non-point pollution. Most of the benefit is indirect in that by rotating crops insect and disease cycles are interrupted so chemical controls are proportionately reduced. <u>Applies to all agricultural crops except trees and vines.</u>

AG-02 Contour Farming (330): Consists of growing crops in upland areas following the natural contour of the field. This is a highly effective practice for reducing soil erosion; however, there are limited opportunities to apply the practice in this area because of most field conditions. In general, the practice cannot be effectively applied to fields with undulating topography, or irregular shapes, which is the norm for this region. <u>Applies to all agricultural crops grown on sloping topography.</u>

AG-03 Critical Area Planting (342): Establishes vegetation on critically eroding areas, and may include domestic plants, native or naturalized species. It may also require various forms of mulching, tackifers or fiber mats to help establish the plants. Applies to all land uses.

AG-04 Divided Slope *Farming (196):* Consists of farming sloping ground so that it is divided by erosion resistant plantings to buffer the effects of water erosion. Usually the buffer plantings are a grass or legume. Applies to growing annual crops on sloping land.

AG-05 Filter Strip (393): Consists of a strip of close growing vegetation strategically placed to provide a filter to trap sediment and other contaminants washing from sloping areas. In most cases, it is employed to protect streams, but it may be used to filter runoff from urban areas or around concentrated livestock areas. The width of the strip, to be effective, is dependent on the degree of slope, size, and use of the hydrologic province. In general, a minimum width of at least 25 feet should be employed. Applies to all land uses, including urban applications.

AG-06 Residue Management (329): There are many forms of plant residue management ranging from modest amounts remaining after a modified tillage program to maximizing the ground cover by leaving all of the previous crop residue under a no tillage program. The primary intent is to reduce soil erosion. Other benefits include forage and cover for wildlife, improved soil condition, and some moisture conservation. This practice can be employed for irrigated or non-irrigated annual crops. The most benefit in reducing soil erosion is derived when it is applied to dry-farmed crops. However, dry-farmed crop rotations can preclude using this practice unless herbicides are included in the management. Winter plantings are not a major problem because there will be adequate soil moisture, but some crop rotations include spring plantings for such crops as beans, safflower, or Sudan grass. When spring plantings are in the rotation then soil moisture must be conserved, and typically, most farmers do this by tilling winter volunteer growth along with any plant residue. The alternative is to employ herbicides. Applies to all annually cropped areas for erosion control, particularly in dry farming conditions.

AG-07 Strip Cropping (586): Consists of growing crops in strips across slopes to reduce soil erosion. The crops are arranged so that a strip of grass or other close growing crop is alternated with fallow areas or areas with widely spaced crops. Generally applies to upland annually cropped areas for erosion prevention, however, it is sometimes applied to segregate crops to prevent cross pollination.

AG-08 Tree or Shrub Establishment (612): Consists of planting trees or shrubs for erosion control, to reduce air pollution, wildlife use, visual screens, and other purposes. Applies to all land uses to filter contaminants from the air or water.

AG-09 Vegetative Buffer Strip (194): Consists of a strip of close growing grasses or legumes located at strategic areas to trap eroded soil and to filter nutrients. The strips may be annually planted or perennials. The width may vary depending on the size and topography of the drainage area. A minimum width of 12 feet is recommended. <u>Applies to all land uses to serve as a filter for sediment, nutrients and other pollutants.</u>

AG-10 Windbreak Establishment (380): Consists of a linear planting of trees an/or shrubs to buffer the effects of wind, visual screening or wildlife habitat. The width of the planting depends on the objectives of the landowner. <u>Generally applies to the vineyard industry; however, it is a useful practice under any circumstance to reduce wind erosion, and to filter air borne and water contaminants.</u>

AG-11 Cover Crop (340): Consists of a close-growing grass or legume primarily grown for seasonal protection and soil improvement. In some cases, if irrigated, a permanent cover is maintained. <u>Applies to farmed land.</u>

AG-12 Mulching (484): Consists of applying plant residue or other suitable material to soil surfaces to prevent erosion, conserve water, control weeds and other purposes. <u>Applies to all land uses.</u>

STRUCTURAL PRACTICES –

Structural practices all require a proper design to be effective and should be planned by a qualified engineer. In most cases, efficient erosion control will require a combination of measures.

The practices listed below are the most common measures employed. Other measures may be required, depending on site conditions.

STR-01 Access Road (560): Applies to dirt roads constructed as access, hauling or other transportation needs. Poorly planned and constructed dirt roads are probably the single largest contributor to soil erosion in newly developed areas. Two excellent references are available for review at any NRCS office: “Guide to Building Small Roads” and “Building Water Pollution Control into Small Private Forest and Ranchland Roads”. <u>Applies to all land uses that require road access.</u>

STR-02 Cut Bank Stabilization (195): Consists of vegetative and/or structural measures to protect bare earth from erosion. The practice is usually associated with the construction of roads, building pads and similar facilities. It requires that slopes of not less than 2:1 be provided to create a stable environment for vegetation to become established. Slopes less than 2:1 require structural measures such as retaining walls to develop slopes of at least 2:1. <u>Applies to all land uses.</u>

STR-03 Diversion (362): Consists of a properly graded channel across the slope to intercept and reduce the size of the hydrologic province. This is a common erosion control practice on steep areas; however, the limit maximum limit of slope on which this practice can be applied is approximately 30 percent. It is most often applied on perennial cropland, or to help stabilize unprotected slopes created during road construction. It requires careful consideration of the soil to determine the correct gradient, and to dissipate water energy at the outlet. This practice usually applies to any land use conversion of upland areas. It is a permanent method of erosion control.

STR-04 Fence (382): Consists of a barrier to include or exclude animals, including humans. The type of material depends on the intended use, and may include subtle barriers such as living fences of shrubs or trees. Applies to all land uses.

STR-05 Grade Stabilization Structure (410): Consists of installing structures to control the grade of natural or artificial channels to prevent head cutting. Requires designing by a competent engineer. This is a common erosion control practice in this area because of the many deeply incised and relatively steep channels encountered. In some cases, it is the only practical alternative; however, it is relatively costly and not likely to be applied unless there are substantial on-site benefits to the landowner. Applies to all land uses for erosion control.

STR-06 Grassed Waterway (412): Consists of a dedicated channel that is shaped to specific dimensions and has suitable vegetation to convey runoff without causing erosion. This is a relatively economic alternative for stabilizing watercourses, and is particularly useful in controlling ephemeral erosion problems. There are limits of channel grade that dictate if structural grade checks may be required also. Because of the climate, irrigation is required to establish the plants for the best results. Perennial plants are preferred if year-round irrigation is available. Applies to all land uses for erosion control and a filtering system.

STR-07 Heavy Use Area Protection (561): This practice applies to areas that are heavily used in urban or recreational environments. Various alternatives to pavement are offered. Applies mostly to urban areas to prevent erosion and to reduce runoff.

STR-08 Irrigation Field Ditch (388): This practice defines minimum cross-sectional and side slope requirements for the construction of earthen ditches associated with surface drainage of farmed fields. Applies to annually cropped land for erosion control.

STR-09 Irrigation Land Leveling (464): Defines slope requirements and cut and fill procedures for shaping fields so they can be gravity flow irrigated. Applies to annually cropped land for efficient application of irrigation water and nutrients.

STR-10 Obstruction Removal (500): Consists of the removal and disposal of unwanted or hazardous structures, trash and other material. Spoiling waste in channels was a relatively common practice in times past; however, it has been substantially reduced in recent years because of land use regulations. Nonetheless, it still occurs largely by illegal dumping much of which is by the urban community. Applies to all land uses.

STR-11 Pond (378): Ponds are constructed facilities to impound water for wildlife, fishery establishment, livestock water sources, irrigation water, and fire control. This practice specification refers to trapping surface waters, and does not include irrigation regulating reservoirs that are normally constructed out of channels. There are numerous existing ponds in the watershed. Most are used as livestock watering facilities. When used for this purpose, it is recommended that the ponds are fenced and water transported to an off-site trough. This will substantially reduce biological contamination from animal feces, and preserve the service life of the ponds by reducing bank erosion. Unfortunately, most if not all, existing ponds allow free access. Few new ponds are expected to be constructed in the future because of the high costs and difficulties in obtaining water rights, and similar concerns with permitting by regulatory agencies. Usually applies to ranching.

STR-12 Road Removal (209): Defines general procedures and considerations when removing dirt roads. Each site is considered unique, so removal specifications must be adjusted to fit the conditions. Applies to all land uses.

STR-13 Sediment Basin (350): Consists of a dam specifically constructed to capture sediment from uncontrolled upstream sources. They are usually very functional in trapping most coarse material; however, clays and most silt is usually passed through because they stay in suspension for long periods. They are relatively expensive to construct and require long term maintenance. Applies to all land uses.

STR-14 Spring Development (574): Consists of controlling springs or seeps and providing an off-site water collection facility such as a trough. All such developments must be fenced to avoid damage and contamination. If feral hogs are present, appropriate fencing is required to prevent wallowing. Usually applies to livestock ranching.

STR-15 Streambank Protection (580): Consists of using vegetation and/or structural practices to protect banks from scour and erosion. In most cases, banks must be reshaped to a minimum of 1 ½ :1 in order to establish vegetation.

Incised areas that are in excess of four feet in depth will require a set back of at least 2:1. Applies to all land uses.

STR-16 Terraces (600): Consist of earthen embankments and channels that are located on a contour across the slope. The purpose is to reduce slope lengths to reduce sheet and rill erosion and the formation of gullies. They provide permanent erosion control. Under many farming conditions, they can be designed so that there is little loss of planting area. Mostly applies to dryland farming. However, it is a preferred practice for all types of agriculture when fields are relatively long and have uniform slopes of less than 10 percent.

STR-17 Trough or Tank (614): Consists of tanks and troughs for livestock and wildlife watering. The devices must have adequate devices for water control, and proper footing material around the trough to prevent trenching. Troughs should also include a wire cloth ramp or similar device to provide access and an escape route for small mammals and birds. Applies to livestock ranching.

STR-18 Gabions (704): Consists of design considerations for installing rock filled wire mesh baskets to control erosion. This practice usually is for protecting unstable stream banks where the height and slope prevent the application of vegetative measures. Applies to all land uses.

STR-19 Rock Riprap (707): Consists of using loose or grouted rock to prevent soil erosion. Defines the rock specific gravity required, and placement procedures. Applies to all land uses.

STR-20 Post and Wire Revetment (706): Consists of installing a wire revetment as stream bank protection in critically eroding areas. The revetments may be single, or double with rock filling. Considerations are defined for lateral braces, placement depths, groin requirements and material specifications. Applies to all land uses.

STR-21 Well Decommissioning (351): Defines procedures and considerations for retiring old wells to prevent contaminated water, vermin, or other foreign substances from entering the groundwater. Applies to all land uses.

STR-22 Underground Outlet (620): Consists of a conduit installed beneath the surface of the ground to collect and convey surface water to a suitable outlet. Applies to all land uses.

MANAGEMENT PRACTICES

MP-01 Agrochemical Handling: The California Department of Pesticide Regulation posts the Code of Regulation for Pesticides and Pest Control Operations on the Internet at http;//cdpr.ca.gov/docs/inhouse/calcode/3ccrcovr.htm. A printed abstract entitled

“Summary of Selected Laws and Regulations A Guide for Users of Pesticides” is available at any Agricultural Commissioner’s Office in Santa Barbara County.

The following guidelines for protecting groundwater were also prepared by the Santa Barbara County Agricultural Commissioner’s Office. They are only guides. Pesticide users must refer to the actual sections of the laws and regulations that govern activities concerning chemical use.

(1) Avoid point source contamination. Do not store, mix, ar apply pesticides, or rinse equipment near wells, streams, lakes, ditches, or other water sources unless allowed by label.
(2) Wells should not serve as a catchment for surface water runoff containing pesticide residues. Berm around wells, if necessary, to prevent water containing pesticide residues from entering well heads. Wells should be properly sealed and cased. Properly seal abandoned wells.
(3) Use backflow prevention devices or air gaps when filling tanks or chemigating.
(4) Follow label restrictions concerning applications to certain soil types, sites, and groundwater levels.
(5) Avoid excessive leaching and runoff from treated areas. Do not over irrigate during incorporation or over apply pesticides.
(6) Containment ponds should be lined to prevent leaching of pesticide wastes into groundwater.
(7) The following chemicals have been found in groundwater and have regulations that restrict their usage: Atrazine, Bentazon (Basagran), Bromacil, Diuron, Prometon (Pramitol), Simazine.
(8) The following chemicals have been determined to have the potential of contaminating groundwater: Cyanazine, Fenamiphos (Nemacur), Fluometuron, Linuron, Methiocarb, Methomyl, Metolachlor, Metribuzin, Naptalam sodium salt, pebulate (Tillam), Vernolate.

MP-02 Air Management (207): Defines procedures and considerations to minimize the degradation of air quality from chemical drift, dust, smoke particles, spores, pollen, and other material. Applies to all agricultural activities and urban developments.

MP-03 Brush Management (314): Consists of removal, reduction or manipulation of non-herbaceous plants to reduce fuel loads in case of wildfire, improve livestock forage, manipulate wildlife habitat, or improve water yield. Careful consideration is required for controlling erosion during, and after, the practice is applied. The most common form of brush control is prescriptive burning, although mechanical devices are often used for type conversion of the landscape. This practice is useful when properly applied in preventing massive soil losses and sediment transport usually associated with wildfires. Applies to rangeland.

MP-04 Prescribed Grazing (528): Consists of the controlling livestock with the intent of achieving specific objectives such as maintaining and improving the health of the plant community. On annual range, the practice involves prescriptive movement of animals to ensure that there is opportunity for the preferred species to set seed, and to ensure that there is adequate residual dry matter to protect the soil from erosion. Applies to livestock ranching.

MP-05 Urban Chemical Handling: Follow instructions on the label, including the proper method of disposal of empty containers.

MP-06 Use Exclusion (472): Consists of constructed barriers to exclude access to sensitive areas. It is usually associated with range management and primarily associated with protecting surface waters such as ponds and spring developments.

5.6 Biological management practices:

The following practices are only components of more holistic integrated pest management (IPM) plans. Ideally, comprehensive IPM plans would be employed. In most case, establishing an IPM plan requires the services of a pest control advisor. Comprehensive IPM plans are most common with perennial crop growers, but are slow to be adopted by annual crop producers. The principal reason for low adoption rates is that there is a low threshold of tolerance for crop damage, and the rapid turn-around time in crop production. Nonetheless, there are many opportunities to implement pest-monitoring techniques so that pesticides could be used as a cure to reduce plant damage rather than a preventive strategy.

Resources should be located to conduct experiments and research the use of pheromone traps and pheromone confusion techniques for pest controls of vegetable crops. (The use of pheromones as a pest management strategy has proven to be highly successful in protecting a variety of perennial crops.)

BIO-1 Owl Boxes: Consists of the construction of boxes to provide artificial nesting cavities where natural nesting sites are lacking to encourage colonization by Barn Owls. The boxes require mounting on poles when trees or other mounting sites are lacking. When they are pole mounted, the boxes are frequently used as raptor roosts during their hunting forays. The combined effect of encouraging both owls and raptors can be highly effective in providing control of both nocturnal and diurnal rodents. Drawings and specifications for the construction of the boxes are available at the RCD/NRCS field offices. This practice has a universal application for all land uses

BIO-2 Bat Boxes: Consists of the construction of artificial roosting cavities to attract bats. This practice is useful in providing control of winged nocturnal insects. They also require mounting on poles if other sites are lacking. Drawings and specifications are available at the RCD/NRCS field office. This practice applies to all land uses.

BIO-3 Beneficial Insect Habitat: Consists of establishing plant species that can serve as hosts of beneficial insects and help to increase populations. This practice also includes the removal of plants that may attract predatory insects, or serve as disease vectors. The selection of plant species, including identification of undesirable species, should be done by a competent specialist. This practice should be considered when planning other agronomic practices such as filter strips. The practice applies to all land uses.

BIO-4 Organic Mulches: Consists of applying organic mulches in both fully composted form and as chopped green waste. The materials may be produced on site or recycled from other sources such as municipal green waste. This practice is to conserve moisture, reduce weeds, a source of micro-nutrients, and other purposes. The practice applies to all land uses.

BIO-5 Pheromone Sticky Traps: Consists of using pheromones as a detection system to determine if specific insect pests are present. The traps are primarily used to detect apple maggots and codling moths. Most commonly employed in the apple growing region of Cuyama Valley.

BIO-6 Pheromone Confusion: Consists of establishing stations that emit pheromones to attract and confuse male moths and disrupt the mating cycle. To date they have not been necessary in this watershed. The usual procedure is to install “puffers” that emit the pheromones at fixed intervals and time of day. Most commonly would apply to the apple industry.

BIO-7 Alfalfa Weevil Control with Sheep: Consists of using sheep to eliminate all top growth in alfalfa fields during the winter dormant season to reduce over-wintering habitat of alfalfa weevils. This practice also eliminates winter weed growth and the necessity for herbicide applications. Sheep are the preferred livestock because of their grazing habits. Applies to interior alfalfa industry.

BIO-8 Pest Sampling: Consists of establishing a monitoring program to detect the presence or absence of insect pests. This practice includes such procedures as timed search sampling, whole plant samples, beating trays, sticky traps, and pheromone attractants. The practice requires consistency and precise record keeping. The purpose is to judiciously use pesticides as a cure when pests occur rather than a preventive strategy. Applies to all farming enterprises.

BIO-9 Tailwater Filter System: Consists of using agricultural tailwater to irrigate riparian habitat in the Santa Maria River. There are approximately eight tailwater discharge points between Fugler Point and the Highway 1 bridge near Guadalupe. These tailwaters are generally confined to narrow strips and percolate into the aquifer rapidly. These waters would be used to irrigate new riparian vegetation using temporary sprinkler systems. The waters all have relatively high nutrient content that will be assimilated by the vegetation. Applies to special locations as defined in Section ????.

5.7 Practice Ratings:

Table 5.7 is an assessment of each practice listed in this plan. The evaluations are subjective opinions based on past experiences, and they are meant to be used as a guide rather than a prescription for implementation.

The evaluations were rated using the following criteria: (1) Effectiveness in reducing NPS pollution; (2) Technical feasibility; (3) Probability of landowner acceptance; (4) Funding constraints; (5) Institutional constraints; (6) CEQA requirement.

Columns (1), (2), and (3) are rated as high (H), medium (M), or low (L).

High (H) - (1) Will result in a major reduction of NPS pollution.
- (2) Easily understood, does not require technical assistance.
- (3) Landowner is likely to readily accept.

Medium (M) - (1) Addresses part of NPS, requires other practices be applied.
- (2) Written guidance available, may require some consultation.
- (3) Landowner may accept, but some outreach required.

Low (L) - (1) Minor effect on NPS reduction, requires other practices.
- (2) Likely to require technical assistance.
- (3) Landowner unlikely to accept unless a regulated requirement.

Columns (4), (5), and (6) are rated yes (Y), maybe (X), or no (N).

Yes (Y) - (4) Unlikely to implement without financial assistance.
- (5) Multiple permit requirements.
- (6) Likely to trigger CEQA procedures.

Maybe (X) - (4) May accept practice without assistance if b/c is favorable.
- (5) Can be installed with local agency permits only.
- (6) Environmental mitigation by field agreement.

No (N) - (4) Financing not likely a problem.
- (5) No permits required.
- (6) No environmental mitigation requirement.

TABLE 5.7 – Practice Ratings

Practice	Effective (1)	Feasible (2)	Accept (3)	Funding (4)	Institutional (5)	CEQA (6)
EP-01	H	H	H	N	N	N
EP-02	H	M	M	N	N	N
EP-03	H	M	M	X	N	N
EP-04	H	M	M	N	N	N
EP-05	H	M	M	N	N	N
AG-01	H	H	H	N	N	N
AG-02	H	M	M	N	N	N
AG-03	H	H	H	N	N	N
AG-04	H	M	M	N	N	N
AG-05	H	M	M	N	N	N
AG-06	H	H	H	N	N	N
AG-07	H	H	L	X	N	N
AG-08	M	H	M	N	N	N
AG-09	H	H	M	N	N	N
AG-10	M	H	L	X	N	N
AG-11	H	H	M	N	N	N
AG-12	M	H	H	N	N	N
STR-01	H	M	M	N	Y	X
STR-02	M	M	H	N	X	N
STR-03	H	L	M	X	X	N
STR-04	M	H	L	Y	N	N
STR-05	H	L	H	X	Y	X
STR-06	H	L	M	N	X	N
STR-07	H	M	M	Y	N	N
STR-08	H	H	L	N	N	N
STR-09	M	H	H	N	X	N
STR-10	H	M	L	Y	X	N
STR-11	M	H	H	N	N	N
STR-12	L	L	H	Y	Y	X
STR-13	H	M	L	Y	X	X
STR-14	H	L	M	Y	Y	X
STR-15	M	M	H	N	N	N
STR-16	H	L	M	Y	Y	X
STR-17	H	L	M	Y	X	N
STR-18	M	M	H	N	N	N

Practice	Effective (1)	Feasible (2)	Accept (3)	Funding (4)	Institutional (5)	CEQA (6)
STR-19	H	L	M	Y	X	X
STR-20	H	L	M	Y	X	X
STR-21	H	L	M	Y	X	X
STR-22	H	H	M	N	N	N
STR-23	H	M	H	X	X	N
MP-01	H	H	H	N	Y	N
MP-02	M	H	H	N	N	N
MP-03	M	M	H	Y	Y	X
MP-04	M	Y	M	N	N	N
MP-05	H	M	L	N	N	N
MP-06	H	H	M	Y	N	N
BIO-1	H	M	H	N	N	N
BIO-2	M	M	M	N	N	N
BIO-3	M	L	M	N	N	N
BIO-4	M	M	M	X	N	N
BIO-5	H	L	H	N	N	N
BIO-6	H	L	H	N	N	N
BIO-7	M	H	H	N	N	N
BIO-8	H	M	M	X	N	N
BIO-9	H	H	H	N	N	N

5.8 Special Practice Investigation:

One of the critical concerns in the Santa Maria River watershed is the accelerated sediment deposition in Twitchell Dam. A review of the area upstream of the dam indicates that at best only nominal reductions in erosion could be achieved within economic reason.

The primary sources of sediment are geologic in nature, much of which occurs on public land where there are institutional constraints in addition to the extremely high costs of implementation. Many of the worst erosion sources are in extremely steep, and difficult to access areas that offer little opportunity to install workable practices. The region where most of the erosion occurs is also very arid averaging less than 10 inches of rain per year, and much of the rain occurs in brief high intensity storms. This arid climate makes vegetative erosion controls difficult to employ.

Another major source of erosion is the Cuyama River. Almost every outside meander throughout Cuyama Valley is actively eroding. Most of the banks are nearly vertical and exceed 20 feet in height so the application of structural devices is the only way to effectively reduce the erosion. There is little incentive for local landowners to install bank protection because most of the area is rangeland with modest land value. Some of this erosion may have been accelerated when Highway 166 was relocated. As stated previously, the river reach between the western end of Cuyama Valley and the dam was shortened considerably. In all likelihood, this accelerated erosion in that reach, and the accelerated erosion may have continued into Cuyama Valley; however, there is no conclusive evidence.

Farming practices in Cuyama Valley make no measurable contribution to the sediment concern. The farmed areas are flat, or nearly so, and the cropping patterns are such that erosion is of little concern.

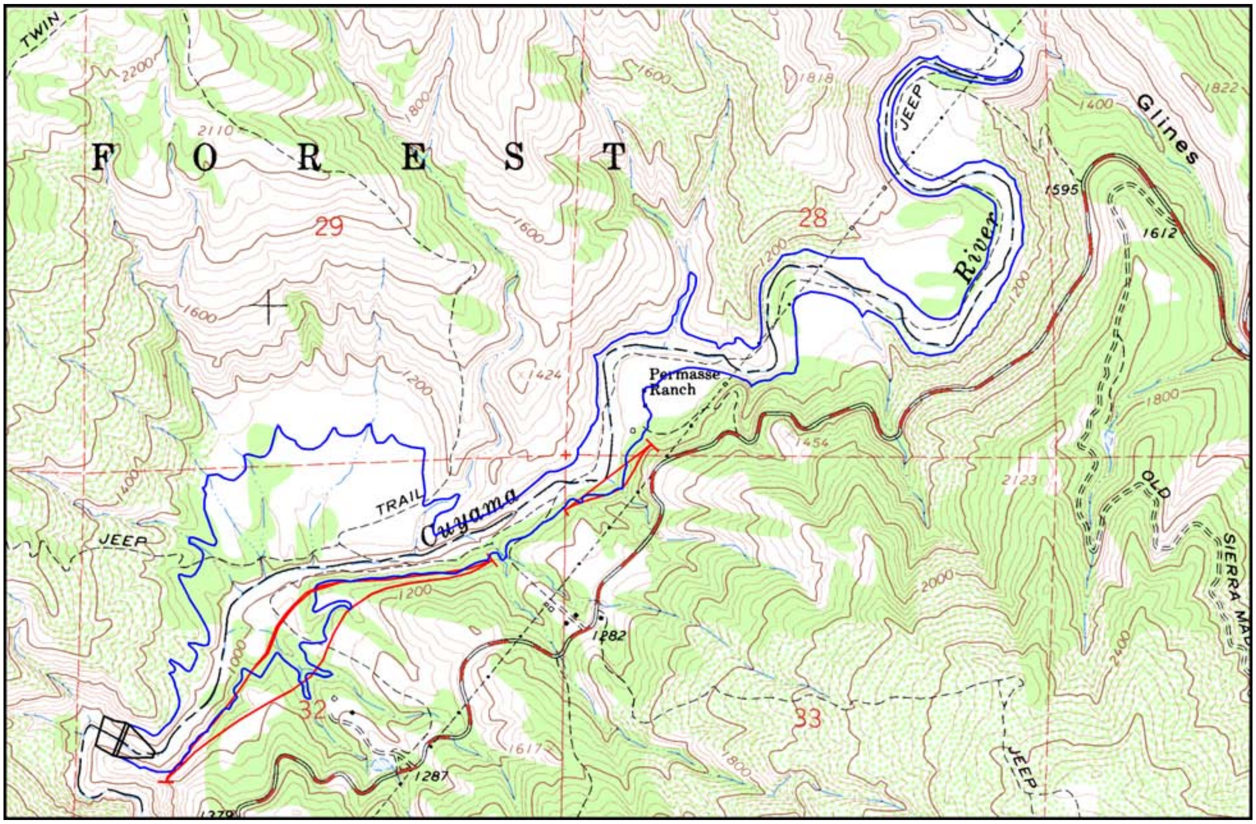
Since there is little opportunity to reduce erosion, several locations were identified that have the potential to trap at least part of the sediment load. In addition, these sites could also serve as water storage areas until they fill with sediment. Stored water could be released after supplies are depleted in Twitchell Dam, and/or they could be used for water-based recreation. Unfortunately all of the sites would require a relocation of Highway 166 in order to get a reasonable storage volume.

Developing a benefit/cost ratio for any of the sites is beyond the scope of this project, and dependent on water values. (The value of groundwater has not been established.) Potential benefits could include:

(1) Any sediment reduction in Twitchell Dam would be a recurring water storage value.
(2) Sediment basins would also serve as interim flood control facilities.
(3) Sediment basins could temporarily provide additional water storage during periods of abundance with releases made after the Twitchell Dam conservation pool is exhausted.
(4) Wetland habitat would be created for its intrinsic value. Or, the facilities could serve as mitigation for other water management activities.
(5) Sites could provide water based recreational activities until they are filled.

Following are assessments of various sites in the Cuyama River watershed that could be used as sediment basins:

Figure 5.8A. Sediment Basin – Garcin Site

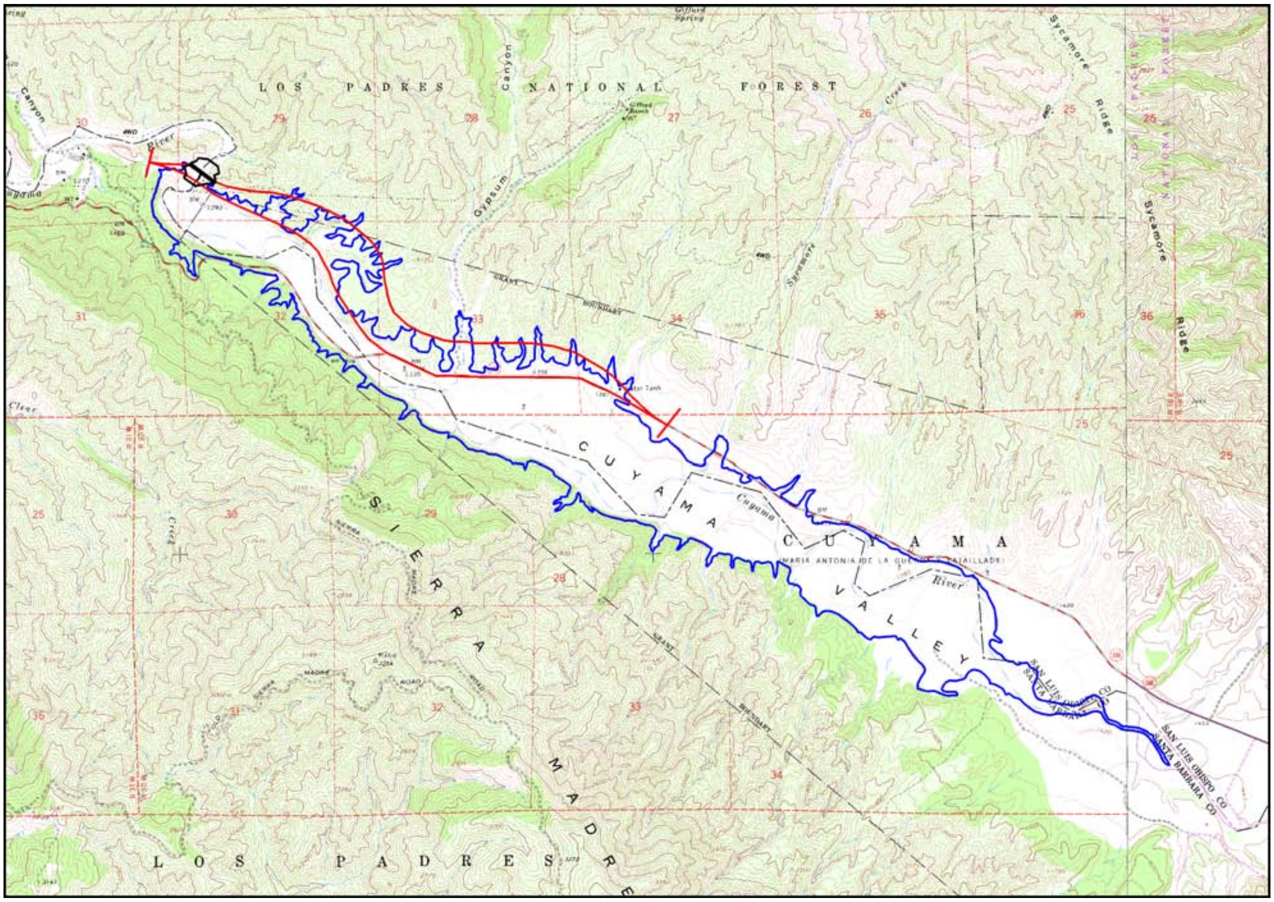


“GARCIN” SITE

"CHIMNEY CANYON" 7.5 minute quadrangle				
Latitude 35º 04' 10" Longitude 120º 10' 10"				
Slope Along Channel Invert: R1: EL. 920 to 960, L = 6,500', S = 0.0062; R2: EL. 960 to 1000, L = 5,200', S = 0.0077				
ELEVATION	SURFACE AREA (acres)	VOLUME (ac. ft.)	SIDE DRAINS AFFECTED	LENGTH OF HIWAY AFFECTED (L. F.)
959	0.00	0	0	0
1080	230.02	8,986	2 culverts	5,713

NOTE: Waterline shown is at dam elevation 1080.

Figure 5.8B. Sediment Basin – Rock Front Site



"ROCK FRONT" SITE

"MIRANDA PINE MTN." 7.5 minute quadrangle

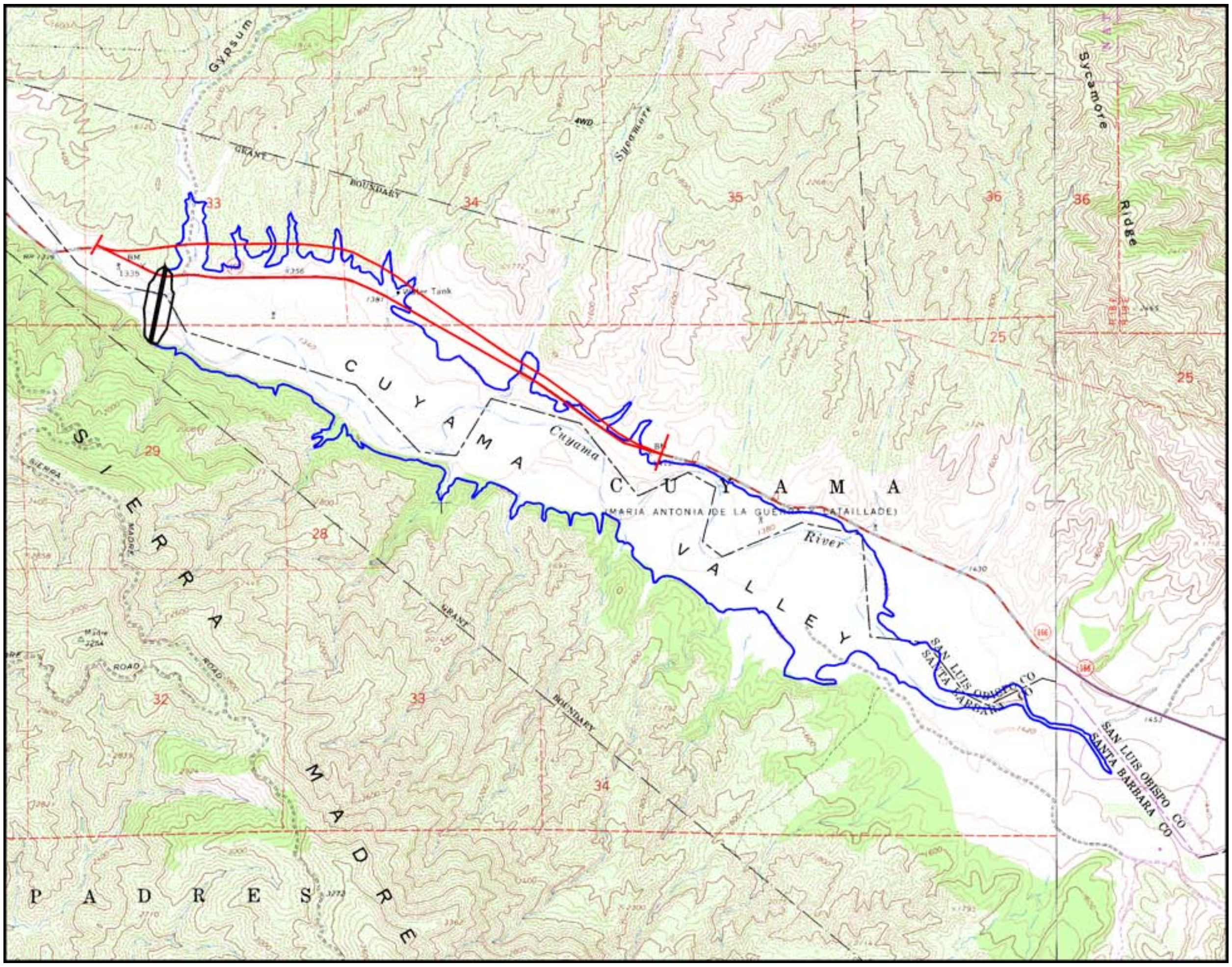
Latitude 35° 06' 40" Longitude 120° 05' 00"

Slope Along Channel Invert: R1: EL. 1240 to 1280, L = 9,700', S = 0.0041
R2: EL. 1280 to 1320, L = 11,617', S = 0.0034

ELEVATION	SURFACE AREA (acres)	VOLUME (ac. ft.)	SIDE DRAINS AFFECTED	LENGTH OF HIWAY AFFECTED (L. F.)
1270	0.00	0	0	0
1360	693.57	22,653	3 culverts	3,913
1400	1319.31	62,911	1 RBC, 4 culverts	16,715

NOTE: Waterline shown is at dam elevation 1400.

Figure 5.8C. Sediment Basin – Gypsum Canyon Site

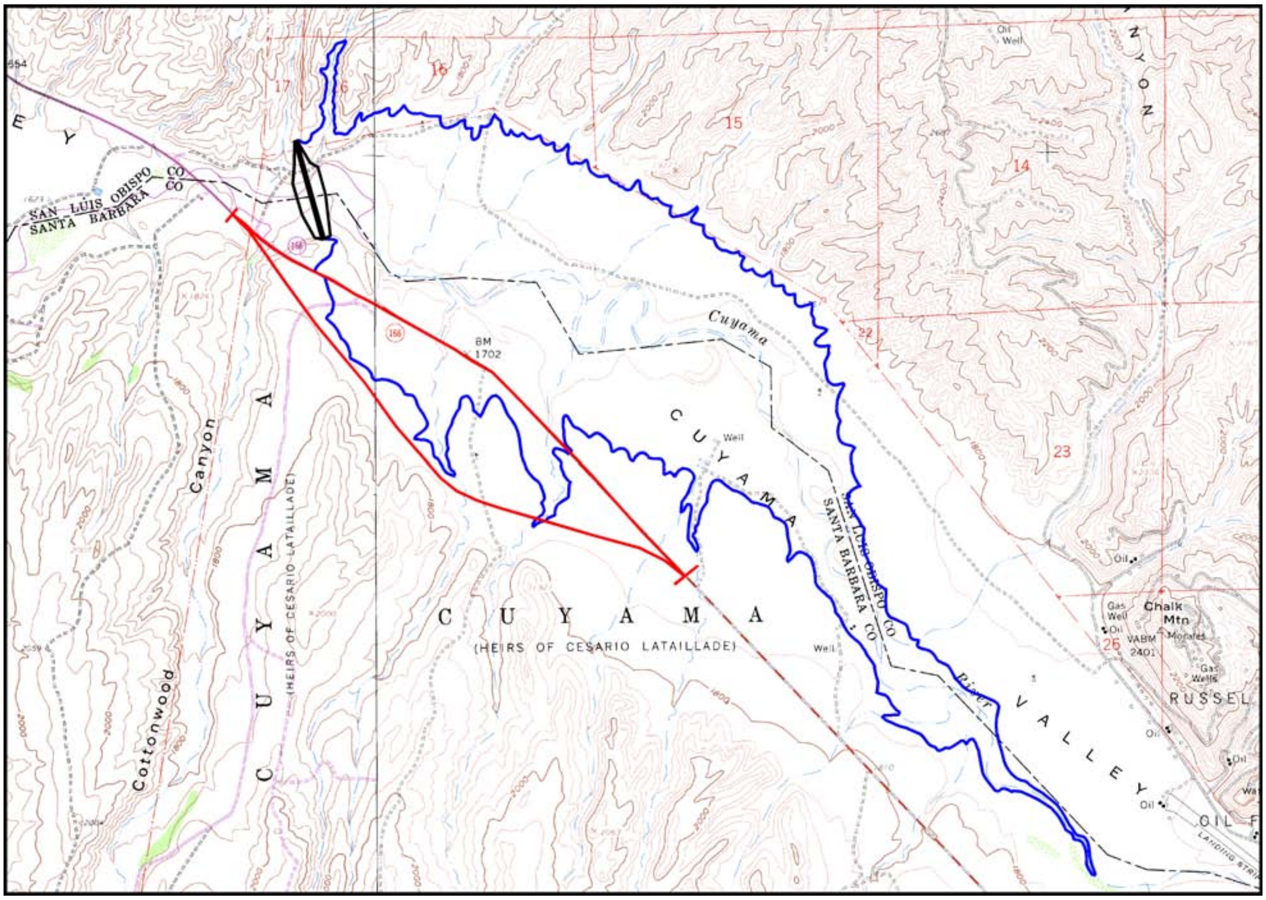


"GYPSUM CANYON" SITE

"MIRANDA PINE MTN." 7.5 minute quadrangle				
Latitude 35° 05' 45" Longitude 120° 03' 45"				
Slope Along Channel Invert:		R1: EL. 1280 to 1320, L = 11,617', S = 0.0034 R2: EL. 1320 to 1360, L = 12,620', S = 0.0032		
ELEVATION	SURFACE AREA (acres)	VOLUME (ac. ft.)	SIDE DRAINS AFFECTED	LENGTH OF HIWAY AFFECTED (L. F.)
1312	0.00	0	0	0
1360	410.46	7,208	2 RBC, 2 Culverts	5,550
1400	944.07	34,299	3 RBC's, 4 Culverts	12,800

NOTE: Waterline shown is at dam elevation 1400.

Figure 5.8D. Sediment Basin – Cottonwood Canyon Site



"COTTONWOOD CANYON" SITE

"TAYLOR CANYON" 7.5 minute quadrangle

Latitude 35° 02' 20" Longitude 119° 52' 40"

Slope Along Channel Invert: R1: EL. 1600 to 1640, L = 13,700', S = 0.0029
R2: EL. 1640 to 1680, L = 15,336', S = 0.0026
R3: EL. 1680 to 1720, L = 7,198', S = 0.0056

ELEVATION	SURFACE AREA (acres)	VOLUME (ac. ft.)	SIDE DRAINS AFFECTED	LENGTH OF HIWAY AFFECTED (L. F.)
1624	0.00	0	0	0
1680	402.26	9,374	1 RBC	1,764
1720	1237.10	42,162	1 RBC	11,170

NOTE: Waterline shown is at dam elevation 1720.

5.9 Practice Recommendations:

The recommendations in this section only list minimum practices that should be considered to reduce non-point sources of pollution. Other practices may apply; however, they would be dictated by site conditions. Section 5.3 provides a checklist of site conditions that should be considered before any land use conversion is considered. It would be a wise decision to consider these suggestions before any major investment is made.

5.9.1 Agriculture, irrigated annual upland crops:

EROSION/SEDIMENT CONTROL:

Land treatments for soil erosion control on annually cropped upland areas will vary depending on the degree of slope, soil texture and the hydrologic province. At some sites, erosion control will require a cooperative effort of several landowners. Under any circumstance, farmed upland areas will suffer from soil erosion unless certain minimum practices are applied for protection during the rainy season. The practices might be as simple as leaving plant residue on the soil if the land is left fallow during winter, or relatively complex and expensive if permanent structural devices are required. Winter cover cropping is also a relatively inexpensive alternative to other treatments if the land is to be fallow during the critical winter months. Cover crops can include any type of close growing plants.

At a minimum, the following agronomic practices are recommended to reduce soil erosion and transport of chemicals off-site if the field(s) is to be used to actively produce crops during the rainy season. These practices can reduce erosion rates by 50 percent or more. They are particularly effective if used in combinations. (Other practice may apply depending on site conditions.)

AG-2 (Contour Farming): This practice may not be universally feasible because not all topography is suitable for this practice. As an alternative, cross-slope tillage should be considered. If the slopes are too steep to form planting beds, then permanent structural practices should be considered to reduce the length of slope and the size of the hydrologic province.

AG-4 (Divided slope farming): This practice can serve as an intermediate buffer to filter water borne products from upstream areas, and to disburse water flows and reduce velocities. In general, this practice may not be compatible with growing the type of commodities common to this area, because intermediate crops would have to be close growing such as cereal grains.

AG-5 (Filter strip): Filter strips should be employed as a buffer to intercept field runoff before it enters watercourses. They are particularly important if a full complement of soil conservation measures are lacking on farmed areas.

AG-6 (Residue management): Plant residue should be left on the surface during the wet season, particularly if the field is to be fallow for an extended period.

Permanent forms of erosion control such as terraces or diversions should be considered for all parcels with slopes exceeding five percent. Although there is a cost associated with these devices, they are usually very cost-effective in the long term. In most cases, the planning of such devices will require the services of an experienced engineer. The devices selected will depend on site conditions.

The location and construction methods employed for all dirt roads is also an important consideration, and they should be carefully planned before permanent features such as irrigation systems are installed.

Most of the upland parcels use drip tape as the irrigation water conveyance; however, a few parcels use sprinklers as the primary irrigation system. All upland parcels that employ sprinklers for other than setting seed or vegetable transplants should consider permanent erosion control devices. The need will vary depending on slope and soil type. In general, slopes greater than five percent will require erosion controls to prevent erosion during irrigation if sprinklers are used.

NUTRIENT & PESTICIDE MANAGEMENT:

Hydraulic efficiency and irrigation scheduling are critical if farm chemicals are to be contained on site. <u>All upland farming should employ the battery of practices listed as essential in section 5.3</u>.

If upland parcels are to be fallow for extended periods during the winter months, then an annual grass cover crop (AG-11) should be considered. This may be a grass of commercial value such as hay, or grain crop, or any other grass that has a relatively high nitrate demand. The intent is to provide erosion control and to use residual nutrients before they are leached or transported off-site by winter rains. The crop or residue, if harvested, can be incorporated into the soil to improve tilth, water holding capacity, and serve as a nutrient source.

Crop rotations (AG-1) are already an almost universal application. The practice is probably the single most effective method of reducing the need for pesticide applications because it disrupts potential disease and predatory insect cycles.

Agrochemical Handling (MP-01) and Air management (MP-02) are obvious requirements to limit off-site losses of nutrients and pesticides. These practices are routinely employed by growers.

Biological management practices BIO-1 (Owl Boxes), BIO-2 (Bat Boxes) and BIO-3 (Beneficial Insect Habitat) should be considered as a means to reduce the need for rodenticides, and as a control of predatory insects. These practices can be integrated with other practices such as filter strips. Practice BIO-8 (Pest Sampling) is a means to reduce, or eliminate, some chemical applications.

5.9.2 Agriculture, Leveled irrigated annual crops:

EROSION/SEDIMENT CONTROL:

Most parcels are precision leveled and maintained with the correct slope requirement for gravity flow irrigation and surface drainage during winter runoff. Nonetheless, there is sediment produced because of the affinity for clean water to acquire a bed-load. Other sediment sources from this land use are the drainage ditches because of steep side slopes that result in bank failures. Mitigating practices to reduce erosion are primarily structural in nature, relatively expensive to install and maintain, and require a dedication of land.

The most common practice employed to capture sediment produced from gravity flow is an Irrigation Tailwater Recovery System (STR-10). This practice has a dual benefit in that it allows water and any nutrients it contains to be recycled. An alternative is to replace traditional furrow systems with drip irrigation – an increasing trend in the Santa Maria Valley area.

Ditch erosion control requires reshaping the ditches to a trapezoidal form, and ideally, establishing bank vegetation. Ditch requirements are defined in practice STR-08. Some of the main pickup ditches are along public roads, and may be maintained by the County. The extent of road right-of-ways is unknown, but it appears that any reshaping of these ditches would require encroachment on private lands.

NUTRIENT & PESTICIDE MANAGEMENT

All practices listed 5.9.1 apply including a winter cover crop if the fields are to be fallow through most of the wet season.

5.9.3 Agriculture, irrigated perennial crops:

EROSION/SEDIMENT CONTROL

Irrigated perennial crops are located throughout the planning area, and include sub-tropical fruits, deciduous fruits and nuts, and wine grapes. Site conditions are as diverse as the crops, and non-point pollution control requirements vary accordingly.

The sub-tropical fruit plantings are exclusive to the Nipomo area, and Bull Canyon. Most of the orchards maintain cover crops for erosion control until the orchards mature. At maturity, the orchards have substantial leaf litter that precludes the need to maintain cover crops to control sheet and rill erosion.

Almost all of the deciduous fruits and nuts are located in the Cuyama area and are, for the most part, located on slopes that rarely exceed five percent. The annual rainfall in this area is usually less than 10 inches. Under these conditions, soil erosion control from sheet and rill sources is not a major concern. Nonetheless, some of the growers have installed cover crops that help to further reduce any potential erosion.

Many of the vineyards in the coastal region are located in the upland areas surrounding Santa Maria Valley on slopes ranging to 50 percent, but they rarely exceed 30 percent. In the Cuyama region, vineyards are mostly located on modest slopes of less than five percent.

Much of the sediment produced from perennial crop parcels located on steep topography is from discernible, confined and discrete sources such as pipe outlets, eroding stream channels and road culverts. These sources would logically be addressed as “point sources” of pollution and are beyond the scope of this project. Nevertheless, such sources must be addressed to reduce sedimentation. Many of the “point” sources of sediment pollution are associated with access roads.

Non-point soil erosion is generally defined as sheet and rill erosion. Sheet flow and rill formations in fields will quickly manifest into deep gullies if uncontrolled at an early stage. Because of this erosion potential, growers must address non-point soil erosion to gain full utility of the fields. The following agronomic practices would substantially reduce erosion:

AG-2 Contour Farming: This practice would have limited application because topographic features in this area generally preclude its adoption. Contour farming is a planting consideration that would only apply when developing new vineyards or orchards. In general, this practice also requires that some sort of companion practices such as terraces be installed. A compromise to contour farming is to arrange plantings across the slope. This arrangement would be limited to rather modest slopes because of equipment concerns.

AG-3 Critical Area Planting: This practice should be employed at all disturbed sites that are not planted or dedicated to other use.

AG-5 Filter Strip: Filter strips are highly effective to serve as a sediment and chemical buffer between orchards or vineyards and watercourses, and should be considered for all upland plantings.

AG-11 Cover Crop: Cover crops are an absolute necessity. Ideally, they should be established well before the winter season which should be no problem with vineyards because most have overhead sprinklers for frost protection. The best cover crops would be perennial grasses or legumes.

NUTRIENT AND PESTICIDE MANAGEMENT

BIO-4 Organic Mulches: Organic mulches in a fully composted form are becoming an increasingly popular method of recycling pomace in the wine grape industry. In some cases, recycled municipal green waste is used. It is a practice that is useful to preserve soil moisture, provide weed and erosion control, and as a source of nutrients. The application of chopped green waste is also beneficial, but more research is required primarily because of the application costs. Several avocado and citrus trials completed in the Central Coast region by the RCD and UCCE in cooperation with local growers have also proven valuable in reducing the incidence of root rot in avocados. The same trials resulted in better vigor and more rapid growth from new plantings of lemons and avocados. Applications of green waste mulches also resulted in a substantial reduction in snail damage to trees and fruit.

All other biological practices should be considered, as applicable, as a means to reduce chemical use. All essential practices apply regardless of the crop.

5.9.4 Agriculture, range land:

In 1995, the SWRCB endorsed the California Rangeland Water Quality Management Plan (CRWQMP) as a component of the state's Coastal Nonpoint Source Pollution Management Plan. The CRWQMP plan is based on a strategy of self- assessment and development. To facilitate this strategy numerous "short courses" for livestock operators were proposed for livestock operators to enable them to identify possible impairments and to plan mitigating practices. These courses are usually offered by the UCCE with assistance by the RCD, NRCS, and others. Several well-attended courses have been offered to date for operators in this project area, and at least one more has been proposed.

This self-initiated approach has three development strategies, including:

(1) Letter of Intent: This level only requires that the operator prepare a letter of intent when there are minimal water quality concerns, or if the operator already has a plan in place that addresses water quality issues. The letter briefly describes water quality status, an implementation plan to correct issues of concern, and a monitoring program to measure water quality improvements.

There is no requirement to file this letter with the RWQCB or any other agency; however, filing the letter is an option for operators to consider. This letter would be used as a negotiating tool if water quality issues should arise.

(2) Nonpoint Source Management Plan: At this level a written plan would be developed to include an inventory of resources, a problem assessment, statement of goals, documentation of existing or proposed management practice, and a progress monitoring program.

This plan could be filed with the RWQCB, RCD, or NRCS if desired. Existing plans that are on-file with the NRCS are acceptable if they address water quality issues which most do.

(3) Recognized Nonpoint Source Management Plan: At this level, a formal management plan is prepared, usually with professional assistance. This plan is filed with the RWQCB for institutional recognition. The operator can then request formal approval from the RWQCB. With this approach, the operator could be eligible for grant support from various agencies if capitol investment to achieve the water quality objectives is prohibitive. This plan could also be used as a waiver in obtaining certain regulatory agency permits.

The complete text of the CRWQMP is available from the RWQCB or the SWRCB. This plan includes the practices listed in this document.

5.9.5 Agriculture, dry farmed annual crops:

In 2000, there were approximately 3,000 dry farmed acres that had mandated USDA conservation plans to control erosion on fields that were identified by the NRCS as highly erodible. These mandates are a requirement of participants in various USDA benefits programs. In general, these plans include practices as listed below. The mandated programs are only in effect during the term of farmer enrollment in the benefits programs.

EROSION/SEDIMENT CONTROL:

Management to achieve adequate erosion control primarily involves agronomic practices. These practices will vary depending on the crops grown. In the coastal area dry land farming rotations may include cereal grains, beans, safflower, and in some cases Sudan grass which may be harvested as a hay crop or grazed in place. In the inland areas, most of the fields are used only to raise grain crops. In the Cuyama region, most of the grain crops are winter rotations from irrigated vegetables. The winter grain crops are important in helping to reduce nitrate contamination because they are largely grown by using residual fertilizers left after harvest of the summer vegetables.

Grain crops are planted in the late fall or winter to take advantage of the seasonal rains. In this circumstance, tillage can be deferred until planting time. However, when alternative crops are spring/summer annuals they cannot be planted until the warmer season, which is coincidental to the end of the wet season. In order to ensure adequate soil moisture, the traditional practice is to till the soil during the winter to eliminate volunteer plant competition for moisture.

Almost all of the dry-farmed land that include summer annuals in the rotation is on sloping topography so the soils are highly susceptible to erosion when they are left bare during the winter months. Contact herbicides can be used as an alternative to tillage to control weeds; however, the cost and perhaps environmental concerns, may preclude their use. Other management practices that can be employed to reduce the erosion potential when summer annuals are part of the rotation are:

AG-2 Contour Farming or cross slope direction of tillage.

AG-5 Filter Strips: The filter strips would have to be planted in the fall and that part of the field would have to be dedicated.

AG-6 Residue Management: This practice would largely be employed when winter annuals are grown in successive years. Crop residue management can be in several forms ranging from leaving modest amounts (~ 30%) to maximum cover with a no till program.

AG-7 Strip Cropping: This practice would be similar to the filter strip practice, but it would require long term planning of the rotation for each field, and would require large fields to be economically feasible. With this practice, the field(s) would be dedicated to alternative strips of crops that would include both summer and winter annuals.

AG-9 Vegetative Buffer Strips: Permanent buffer strips should be considered along all watercourses, particularly when winter tillage is to be employed.

Structural measures for control of sheet and rill erosion are always an alternative, and in some cases, it may be the most economical alternative if the long-term benefits are considered. These measures include the construction of terraces (STR-17) or diversions (STR-03). Both practices are designed to accomplish the same thing - reduce the size of the hydrologic province. The difference between the practices is that terraces are installed on land with long fields with rather modest slopes, and terraces are planned so that most of the facility is also part of the farmed area. Diversions are usually dedicated as water conveyances, and are typically installed on steeper slopes. In either case, the topography will dictate which practice, if any, is feasible.

NUTRIENT AND PESTICIDE MANAGEMENT:

Field measurement for residual nitrate content should be made particularly if beans (a nitrogen-fixing legume) was the previous crop in the rotation. Biological practices BIO-1 through BIO-4 should be considered as permanent measures to help control rodent and insect pests.

5.9.6 Mined land:

Mined lands in this watershed are all permitted by various agencies. These permits include requirements to mitigate the environmental impact of these activities so it would be redundant to propose additional measures.

An exception to this are the many abandoned, and in some cases, active oil well sites. Some of theses sites are highly eroded. Each site is unique, so they would require an on-site assessment to recommend best management practices.

Contaminant by-products associated with the industry are considered as point sources of pollution, and they are beyond the scope of this project.

5.9.7 Public land (federal):

Both federal agencies have extensive plans with prescriptions that ensure that natural resources are protected to the greatest extent possible. These plans provide detailed goals and objectives that address the resource needs in compliance with various Federal laws, codes, and Congressional Acts. In view of this circumstance, no additional planning recommendations are included in this document.

The following was abstracted from the planning documents of the respective agencies:

Bureau of Land Management: Most of the BLM land in this watershed includes livestock grazing, fluid and solid mineral mining and exploration, and recreational use as permissible activities. However, the only region accessible to the public in this watershed is the Caliente Mountain Range, and that is primarily by foot or horseback. Almost all of the other parcels are surrounded by private land, which precludes public use.

The prescription for management of the BLM land is contained in the BLM "Caliente Resource Management Plan". The management objectives of this plan are:

- ♦ Soils exhibit functional biological and physical characteristics that are appropriate to soil type, climate, and land form.
- ♦ Healthy, productive and diverse populations of native species, including special status species, are maintained or enhanced where appropriate.
- ♦ Riparian/wetland vegetation, structure and diversity and stream channels and floodplains are functioning properly and achieving advanced ecological status.
- ♦ Surface and groundwater quality complies with California or other appropriate water quality standards.

All proposed actions affecting lands under BLM jurisdiction are first reviewed by an interdisciplinary team to ensure that they are in accordance with existing laws, regulations, policy and land use plans. The team also evaluates proposals to determine which NEPA category they fit in. The team qualifies and quantifies potential impacts then develops site specific mitigation measures to minimize impacts. Five general categories of mitigation are considered, including:

(1) **Avoiding** the impact by not taking certain actions or parts of actions,
(2) **Minimizing** impacts by limiting the degree or magnitude of the action and its implementation,

(3) **Rectifying** the impacts by repairing, rehabilitating, or restoring the affected environment,
(4) **Reducing** or eliminating the impact over time, and
(5) **Compensating** for the impact by placing or providing substitute resources or environments.

Detailed guidelines are provided to ensure that the management objectives are achieved.
These guidelines include specific standards that must be followed during the development of any action that might affect the resources. The guidelines are categorized under the following topics:

- Land tenure management
- Oil/gas and solid minerals management
- Livestock grazing management
- Recreation management
- Cultural resource management
- Biological resource management
- Air quality management

Forest Service: Direction for local management is provided under a national Forest Plan. That plan is based on Federal laws, various Federal codes, and Congressional acts governing public resources. The Forest Plan is supplemented by a regional plan developed for the LPNF. The LPNF plan incorporates direction provided under the national plan, and expresses goals, objectives and management prescriptions to achieve the desired results for the region.

The goals for the LPNF are expressed in a mission statement as a statement of policy. That statement is:

> *The purpose of the Los Padres National Forest is: Management of watersheds to provide natural resources for people in the long-term.*
>
> *The mission of Los Padres National Forest is to accomplish that purpose through:*
> - *Providing leadership in Forest resource management;*
> - *Managing vegetation for habitat, water production and public consumption and enjoyment;*
> - *Providing an environment which enhances the attraction, training, development, and retention of a cohesive, high performing workforce;*
> - *Managing fire as a major element of the ecosystem;*
> - *Providing for the protection of environmental quality, public health and safety, private property, and the users of the forest;*
> - *Managing and protecting surface resources while accommodating mineral extraction and special land uses;*

- *Providing recreation opportunities appropriate to Los Padres National Forest which are limited or not available elsewhere*

Objectives to achieve the goals are expressed in standards and guidelines for the regional managers. These guidelines address the following issues:

(1) General direction for application of laws and regulations, and general guidelines for coordination with others
(2) Air resources management
(3) Seismic and geologic hazards
(4) Minerals
(5) Watershed
(6) Vegetation
(7) Riparian/Wetland areas
(8) Timber
(9) Integrated pest management
(10) Fish and wildlife
(11) Range
(12) Protection and Fire management.
(13) Law enforcement.
(14) Recreation
(15) Cultural resources
(16) Special land uses
(17) Facilities and transportation
(18) Visual resources

As a final element in the direction of management, the LPNF was divided into specific area prescriptions. These management prescriptions identify the character of the area and the resources that are emphasized for management. There are 37 such prescriptions in the LPNF; however, less than one-half occur in this project area. The dominant prescription emphases in this project area are wilderness preservation and management, general recreation, and range management. Each prescription provides specific objectives for the management area, and standards and guidelines to achieve the objective.

5.9.8 Urban land: Most of the urban area in the plan area is located in or near Santa Maria and Orcutt. Almost all of the surface discharges from these communities are routed through storage basins designed to control floodwaters and to increase opportunity time for the runoff to percolate into the groundwater system. These basins also serve as bio-retention basins to help filter pollutants washed from the municipalities. All of the communities also have legal authority mechanisms to enforce programs that address polluting actions such as illegal dumping or discharging of toxic materials. They also have numerous voluntary, and highly successful, programs to reduce pollutants such as green waste and recyclable products pickup at the resident's door. Other programs include outreach to ensure proper disposal of used oil and paint containers, and more recently an outreach program within the City of Santa Maria to reduce or eliminate recycling water softeners. (The City of Santa Maria recently obtained State water and it is the primary source for the City. This water is a great improvement in quality that requires little or no further treatment.)

Nonetheless, additional practices could be employed to reduce non-point source pollution. The most critical of which is management of the irrigation systems. The RCD has evaluated numerous urban irrigation systems for common green belts, parks and similar areas. Almost all of the systems had poor D.U.'s (< 50%), and relatively poor scheduling practices. Although individual landowner irrigation systems were not included in the evaluations, it is likely that most are operated at the same low efficiencies. The most common causes for poor D.U. are poor designs (generally self developed), broken or mismatched parts, worn parts, or plugging. Because of the poor D.U.'s, irrigations are scheduled to accommodate plant needs of the areas with the poorest uniformity resulting in over-irrigation. Correcting the problems can not only help to reduce salt leaching, but there is an economic incentive because most households typically apply over 50 percent of their water to landscapes. Practice EP-05 should be applied by all turf users.

Slow plumbing leaks, both indoors and outdoors, are common in urban communities. To determine if there are undetected leaks the house water meter can be used. Check the meter reading and then wait for an hour and recheck. (This hour wait obviously means that there should not be any planned use of water.) Meters read in cubic feet, and billing for domestic and industrial use is in 100 cubic foot increments. The daily loss can be determined by multiplying the one hour test by 24, and monthly or yearly losses can be determined by multiplying the daily loss by 30 or 365, respectively. Divide the answers by 100 and then multiply that answer by the water purveyors charges for the unit of water to determine the cost of wasted water from leaks. (One cubic foot is approximately equal to 7.5 gallons so losses in gallons can be determined by multiplying the meter readings by that number.)

Other measures that can be taken to reduce water consumption include alternative landscapes, mulching ornamentals, fruit trees and vines, and conversion to drip or micro-sprinkler systems for landscapes other than lawns. A demonstration garden featuring various landscape alternatives is located at 624 West Foster Road in the Orcutt area. This garden features a variety of plants ranging from ground covers to trees. Most of the plants are native species, and all have relatively low water requirements.

Dumping of garbage and other household waste products in both urban and rural areas is a common problem. Much of this dumping occurs in stream corridors, which accelerates surface water contamination. Household waste dumping is not allowed on private land unless it is a regulated activity, and it is illegal on public lands. There are no new programs to stop this practice except through education starting at an early age, or strict enforcement and prosecution of the perpetrators.

5.9.9 Rural residential: Rural residential zoning in this project area represents a relatively small fraction of the overall land use. The intensity of use on these parcels varies considerably ranging from preservation of the natural landscape to overstocking with livestock. In some cases, the parcels have been cultivated to produce agricultural products for sale.

The most common concerns with pollution associated with this land use are poorly functioning septic systems, too many animals in confinement resulting in soil erosion, improper disposal of manure, and in some cases degradation of riparian areas.

Since each site is somewhat unique, practices to reduce documented or potential sources of non-point pollution would require on-site analysis. Any of the practices recommended for other land uses could apply.

Section 6. IMPLEMENTATION PLAN – NPS POLLUTION PROGRAM

6.1 Overview:

Non-point pollution is an insidious process and in many cases, improvements may not be recognized for an extended period. Faced with that reality, perhaps the single largest obstacle in establishing an implementation program is convincing the various publics that there is a concern. Then have this same public accept the fact that they are part of the problem and could be part of the solution.

A wide-variety of practices can be used to reduce non-point sources of water pollution. These practices range from relatively simple, easily understood management practices, to relatively complex structural practices that require technical assistance. Many of the practices come with a cost; however, all are cost effective when amortized over the life of the practice. In some cases, erosion control for example, the primary beneficiaries may be downstream of the area where the practice is applied.

Many practices associated with erosion control require regulatory agency permits. Obtaining the necessary permits can be a laborious, time-consuming, and costly process. A process that can be so involved that it discourages implementation. In some instances there are conflicting messages by the regulatory agencies. For example, bio-diversity is preached by all of the natural resource management agencies. Yet regulatory processes sometimes conflict with this concept and focus on single species concerns when a sensitive specie or habitat is documented or presumed to be in the area. All of which makes for difficult relationships between landowners and regulators.

6.2 Non-point Source Goals and Implementation Strategy:

The goals and strategy for implementation of this project are in keeping with the policy of the SWRCB.

California water quality objectives as they relate to non-point source (NPS) pollution is defined in a document prepared jointly by the SWRCB and the California Coastal Commission entitled *"Nonpoint Source Program Strategy and Implementation Plan 1998-2013".* The plan certifies that California is in compliance with the requirements of the federal Clean Water Act (CWA) and the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA) related to prevention and control of NPS pollution. The goals of the NPS Program are to:

- Improve water quality by 2013;
- Implement a comprehensive statewide program under the CWA and CZARA, rather than develop a separate program for the coastal zone;
- Target implementation actions that can make a difference in correcting current and potential problems;

- Forge strong partnerships with agencies and individuals that must be involved in the implementation of the management measures; and
- Improve public awareness through education and public awareness programs.

The plan implementation strategy proposed is based on a long-term (15-year) commitment to local stewardship backed up by regulatory authority to achieve the goals. Legal authority is based on the Porter-Cologne Water Quality Control Act and the two primary federal laws – the CWA and the Coastal Zone Management Act. This strategy uses a "Three Tiered Approach" to ensure achievement of water quality standards. Under Tier 1 landowners and resource managers voluntarily implement management practices to achieve water quality standards. "Voluntary" refers to self-determined implementation. Tier 2 allows the Regional Water Quality Control Boards (RWQCB) to use regulatory authority to encourage implementation of best management practices (BMP's). The RWQCB can waive discharge requirements under the condition that progress is made in implementing BMP measures, or alternatively by entering into agreements with other agencies with regulatory authority to enforce implementation of BMP's. Under Tier 3 the RWQCB's specify effluent limitations for waste discharge requirements, and requires that they be installed.

6.3 Public Awareness:

There is a need to inform the public of the non-point pollution concerns and at the same time convey a message that all citizens are contributors albeit some more than others. The urban public needs to be informed on agricultural issues, and they need to be aware of and recognize conservation practices that are already employed by the industry. In general most media stories focus on negative issues and contribute to a communications gap rather than constructive dialog. The public must be aware that water contamination has been the result of a long-term process, and it will take some time before improvements are noticed.

Delivery of the message should be through all media forms, particularly the newspapers, television, and the Internet. Newsletters, such as those published by the Chambers of Commerce, UCCE, and the USDA Farm Services Agency are other methods of gaining attention.

The UCCE should be the lead agency for implementation since education and outreach is one of their principal goals. Technical assistance can be provided by the RCD, NRCS, RWQCB, and others with interest in the subject.

6.4 Outreach/Education – Agricultural Community:

Most of the non-point pollutants are a result of agricultural activities, not because members of this industry are poor stewards of the land, but primarily because it represents by far the greatest land and water use. Because of the size of the industry, the residual contaminants although they may be in relatively small amounts from individual parcels, are collectively significant.

An industry-led coalition of farm operators and owners should be established to provide leadership in addressing the issues of concern. The function of this coalition would be to get a consensus that there is a problem and all are contributors to the problem. This coalition should include representatives from the Farm Bureau, Santa Maria Valley Water Conservation District, and all of the commodity associations. Technical support can be provided by the UCCE, RCD, County Water Agencies, and the NRCS.

One approach that should be considered is a pilot project similar to the "California Rangeland Water Quality Management Plan" whereby farmers would prepare a self-assessment and water quality improvement plan for their properties. Plans could be filed with the RWQCB and include a follow-up of implementation progress. Approved plans, during and following implementation, should be exempt from future regulatory actions relating to water quality. The use of monitoring tools and assessment techniques could be provided by the agencies noted above.

6.5 Outreach/Education – Urban/Industrial Community:

City and county governments have already established intensive education and outreach programs dealing with issues that contribute to non-point sources of pollution. These programs include recycling of product containers, green waste pickup and composting, proper handling and disposal of hazardous wastes, and more recently a program to get the community to reduce the use of water softeners or eliminate them entirely in those areas that have imported state water. Nonetheless, the issue of non-point source pollution should be addressed, and additional outreach programs should be established to mitigate the concern. Emphasis should be placed on water use and proper use of fertilizers and pesticides.

Littering and improper dumping of household trash is a problem. Both of these acts are illegal, but identification of the violators and enforcement of the statutes rarely occurs. Outreach and education programs may help to alleviate the concern; however, strict enforcement of existing laws and punitive actions may be the only way to stop it. Outreach would probably be most effective if it was concentrated in the schools. Littering is common around many of the campuses, and the habitat is probably continued into the adult years.

This task would be best handled by expanding existing education programs. Technical support could be provided by the UCCE and the RCD.

6.6 Technical Support:

Many of the practices required to reduce non-point sources of pollution require on-site technical assistance, yet the number of staff people at the various agencies that provide these services is limited. Allocating resources for prevention would be more cost-effective and certainly, a more palatable approach than cleanup of polluted waters through a regulatory approach. Training for some practices, such as nitrate fertilizer management could be taught in a group setting with limited on-site follow-up. However, many practices or groups of practices, such as structural erosion devices or irrigation system evaluations require on-site assistance throughout the planning and some follow-up during implementation. The RCD and the NRCS working in a partnership provide these services to the extent possible; however, there is typically a two-year backlog in service requests. Services are available through the private sector, but for the most part, they are limited to preparing new land for development, or design of large-scale irrigation systems. Smaller projects, such as the design of on-farm soil erosion control, typically generate little interest from the private sector.

Grant support for additional staff would be an important and welcome source of income; however, a long-term commitment of funds would be necessary for any program to be fully effective because of the training and indoctrination required of new employees. Local agencies that currently deliver technical services include the RCD, NRCS, and the UCCE. Informational services are also provided by various County and City agencies.

6.7 Technology Transfer:

There is a wealth of information available concerning water quality and other natural resource conservation issues. Unfortunately, this information is scattered among agencies making it difficult to assemble data for reference in the development of comprehensive plans. An initial approach to remedying this situation would be to form a network of agencies and private industry representatives. This group would develop an understanding of the capabilities and extent of services each could provide, share information and develop a cross referral list for landowners. This list would include links to technical material furnished by the respective participants. An Internet site should be developed for the database, or an existing site could be used. Printed reference copies should be made available and distributed through libraries, agricultural organizations, appropriate county departments and similar places with public access. A budget and staff time should be provided to update information as needed.

When the information is presented, it is usually by specialists focusing on single concerns such as fertilizer use or soil erosion control. This fragmented approach makes it difficult for land managers to consider the impacts on related issues and develop integrated management plans. Informational links to related subjects should be considered at all workshops, at least to the extent of raising awareness. One of the most important ways to transfer technology is to establish peer advisory groups. Farmer to farmer and rancher to rancher sessions are always effective because they are based on on-the-ground experiences. There is also a perception by some that agency staff is not intimately familiar with farming or ranching operations and cannot make acceptable solutions to resource problems. Several progressive farmers and ranchers are highly respected in this area for their expertise in establishing state of the art conservation and chemical management programs. These programs include such issues as intense fertilizer and water management, biological pest controls and similar practices that are environmentally friendly. Their support should be cultivated to promote the use of these practices.

Water quality monitoring is also completed by a variety of agencies with no central database for assembling information. Many of the monitoring programs are sporadic, incomplete, or lacking in some areas. The result is limited information from which to make informed decisions. A central database should be established, perhaps through the County Water Agency. A meeting should be held with all monitoring agencies to determine their needs, establish monitoring protocol, eliminate unnecessary measurements, and determine future monitoring needs.

6.8 Institutional Constraints:

Probably the single most inhibiting factor for farmers and ranchers wanting to install structural practices for water quality improvement related to soil erosion and sedimentation is the regulatory process. Most structural practices require some sort of landscape alteration and work within stream channels. Invariably these actions trigger the need for multiple regulatory agency permits, and in some cases, an extensive environmental assessment is required. Typically, it is necessary to meet with each regulator independently because scheduling is at their convenience. Separate fees are required and mitigation mandates and timelines may be extensive and sometimes contradictory or redundant. Little consideration is given to expedite projects that are clearly beneficial to the environment, nor are there any fee reductions or waivers. In all, the process is an expensive time consuming effort that many times forces landowners to forgo installation of badly needed projects.

In addition to routine environmental concerns, there are numerous sensitive species in the project area nineteen of which are on the State or Federal government endangered species list. Most of these species are associated with wetland habitats. In some cases, the installation of conservation practices will improve, restore or create habitats that become occupied or have the potential to be occupied by the sensitive species. This may result in added restrictions for the property so it further discourages habitat improvements. The problem is not unique, and there have been encouraging attempts to alleviate this concern in other regions of the country under “safe harbor” agreements. The premise behind safe harbor agreements is that it assures landowners that they won’t incur any new restrictions on the use of their land if they do what they state in the agreement plan. They would be free to develop the land even if it attracts endangered species. However, agreements do not affect any pre-existing restrictions that may apply to endangered species already on the property.

Safe harbor agreements come in two basic forms. One is an agreement between the landowner and the agency responsible for conserving the species, the other is an umbrella agreement. Under the umbrella agreement, an intermediary develops a safe harbor plan for a specific area. This area plan then must be approved by the responsible regulatory federal agency. The responsible federal agency is usually the U.S. Fish and Wildlife Service, but some fish species are under the jurisdiction of the National Marine Fisheries Service.

Ideally, the complex and time consuming permit process could be streamlined to facilitate the installation of environmentally beneficial practices. Perhaps with pre-approval of management practices that are designed according to guidelines from a reliable technical source such as the NRCS Technical Guide. And, the safe harbor concept should be explored on a regional basis, perhaps one plan for the Coastal area, another for the inland regions.

Many California counties have some form of agreement between the RCD's and the NRCS that uses their expertise to facilitate and expedite implementation of the respective county grading ordinances-an exception is Santa Barbara County. These agreements range from simple outreach and education to ensure that adequate plans are being developed (Lake County) to full development or approval of erosion control plans (Napa County). Some program costs are offset by fees others such as Napa County are funded by the county.

The issues of permit streamlining have been discussed many times in the past, but little progress has been made. As a result, there is almost always an adversarial relationship rather than a partnership between landowners and regulators. A determined effort should be made to have meaningful dialog between landowners and regulators at all levels that would lead to a better permit process. And, some exemptions should be considered for practices that are clearly of benefit to the environment.

6.9 Technical and Financial Assistance Sources:

<u>6.9.1 Local Assistance</u>:

USDA-Natural Resources Conservation Service (NRCS): The NRCS provides free conservation planning services to assist landowners in protecting natural resources. They work cooperatively with Resource Conservation Districts (RCD) to ensure that local priorities are addressed. The NRCS has offices with technical staff in Santa Maria, Templeton, and Somis. The Santa Maria field office is associated with the Cachuma RCD. It provides services to that part of the watershed that is within Santa Barbara County and those parts of San Luis Obispo County that are within Santa Maria Valley and Cuyama Valley. The Templeton office is associated with the Coastal San Luis RCD. They provide services throughout San Luis Obispo County except as noted above. The Somis office works cooperatively with the Ventura County RCD. They provide technical services to landowners in Ventura County.

In addition to on-going technical assistance, the NRCS also administers to certain special programs as listed below. (Some of these programs may not be available on an annual basis because of funding limitations. Others may be targeted to specific areas that are not within this project territory.) The Santa Maria office telephone is 805-928-9269. The Templeton office telephone is 805-434-0397.

- **Environmental Quality Incentives Program (EQIP)** – EQIP provides a cost sharing incentive to implement conservation practices that will mitigate resource problems, principally to reduce soil erosion. Cost shares may be up to 75% of the cost for eligible conservation practices, and up to 100% for the cost and establishment of management practices. Conservation practices are physical improvement such as grassed waterways, filter strips, and various structural devices. Examples of management practices are nutrient, grazing, and irrigation water management. The cost share for implementing management practices is limited to three years. Producers enter 5 to 10 year contracts and are eligible for incentive payments not exceeding $10,000 per year or $50,000 total for the term of the contract. This is a competitive program, both nationally and within the state. Currently the Santa Maria River watershed is included in the eligible area. Technical assistance for planning and design of the practices is included for those accepted in the program.
- **Emergency Watershed Protection Program (EWP)** – EWP is similar to the ECP except assistance is provided to rebuild public facilities. The same ruling of disaster applies.
- **Emergency Conservation Program (ECP)** – This program is administered by the Farm Services Agency (FSA); however, the NRCS provides technical services for some projects – See ECP under the FSA listing below.
- **Conservation Reserve Program (CRP)** – CRP is administered by the FSA with technical assistance provided by the NRCS-See CRP under the FSA listing below.
- **Conservation Reserve Enhancement Program (CREP)** – CREP is administered by the FSA with technical assistance provided by the NRCS-See CREP under the FSA listing below.
- **Farmland Protection Program (FPP)** – The FPP provides funds to states, tribes, or local government to help purchase development rights to keep farmland in productive use. Up to 50% of the easement purchase cost is provided. To qualify the land must be in private ownership, have a conservation plan, and other requirements related to production and marketing.

- **Forest Legacy Program (FLP)** – The FLP is similar to the FPP in that it provides financial assistance to local entities to purchase forested land.
- **Forest Stewardship Program (FSP)** – The FLP provides planning assistance to private forest landowners to develop management plans that ensure the long term health, production, and environmental benefit of their property.
- **Forestry Incentives Program (FIP)** – The FIP provides cost sharing and planning assistance that are designed to benefit the environment while meeting demands for wood products. This support is available for private, non-industrial forest land owners.
- **Small Watershed Program (SWP)** – The SWP provides planning and financial assistance to local government sponsors to solve natural resource problems in specific watersheds. Elements that are addressed under the SWP are flood protection, erosion and sediment control, water supply and quality, wildlife habitat enhancement and public recreation. Assistance is limited to watersheds of not more than 250,000 acres. Congressional approval is required.
- **Wetlands Reserve Program (WRP)** – The WRP is a voluntary program to restore wetlands. Participants can establish conservation easements for a period of 30 years or in perpetuity, or they can enter into an agreement where no easement is involved. In exchange for permanent easements, the landowner receives payment up to the agricultural value of the land, and 100% of the restoration cost. The 30-year easement payments are 75% of the land value and restoration cost. The easements set limits on future land use. The voluntary (no easement) agreements are for a 10-year duration, and provide for 75% of the restoration cost. In all instances, the owners continue to control access to the land.
- **Wildlife habitat Incentives Program (WHIP)** – WHIP provides financial and planning incentives to develop fish and wildlife habitat on private lands. Participants agree to implement and maintain practices from a developed habitat improvement plan. The term of the agreement is for 5 to 10 years.

USDA-Farm Services Agency (FSA): The FSA provides various forms of financial assistance to farmers and ranchers. Their office is co-located with the NRCS. FSA programs that are applicable to this project include:

- **Emergency Conservation Program (ECP)** – ECP provides financial and technical assistance to farmers and ranchers for the restoration of land that has been damaged as a direct result of a natural disaster. This program is not available unless the county has been declared a disaster area by the Governor and the President. The FSA provides financial and technical assistance except for certain facilities that require engineering plans and specifications. When engineering services are required, they are provided by the NRCS.

- **Conservation Reserve Program (CRP)** – CRP is a program designed to encourage farmers to convert highly erodible cropland to vegetative cover-preferably native plants. Cost sharing is provided for establishment of the vegetative cover. Another element of the CRP is cost sharing to establish filter strips in farmed fields, and to install riparian buffer strips of native vegetation. Farmers enter 10 to 15 year contracts and receive an annual rental payment for the term of the contract. There are certain rules and restrictions that apply to the land use for those areas that are under contract. Technical services to determine eligibility are provided by the NRCS.
- **Conservation Reserve Enhancement Program (CREP)** – CREP is an expansion of the CRP. It allows the FSA and the NRCS to work in partnership with state and local interests to protect sensitive areas that are not normally eligible under the CRP.

Cachuma RCD: The Cachuma RCD provides similar technical services to those offered by the NRCS. The RCD and the NRCS Santa Maria share a common office and work load. In addition to planning and design of conservation practices, the RCD offers irrigation water management services through its Mobile Lab program. These services include hydraulic evaluations of irrigation systems, and tutorial advice on irrigation scheduling (set time and frequency). The service is free in the Cachuma RCD service area. It is also offered to irrigators in the Coastal San Luis RCD for a small fee.

University of California Cooperative Extension Services (CES): The CES principal focus is on research and education. There are two field offices serving this project area. The offices operate on a cooperative basis so they have the staff and experience to address most issues of agricultural concern under this project. The Santa Maria office can be reached by telephone at (805-934-6240). The San Luis Obispo office number is 805-650-1744.

Pacific Gas and Electric Company (PG & E): PG & E offers free pump tests to agricultural irrigators. Periodically they also offer financial incentive programs that reduce energy demands. This energy reduction usually results in more efficient applications of irrigation water which is an asset in the goal of reducing non-point sources of water pollution. Their telephone number is 800-743-5000.

County Agencies: All of the counties within this watershed planning area offer a variety of services. However, they are somewhat restricted in their participation in new programs because of budget priorities and various mandated programs.

<u>6.9.2 Other assistance:</u> Many county, state, federal, and private entities provide funding for both technical assistance and practice implementation on a competitive basis through grants. The eligibility criteria vary between funders; however, most require that the grantee be a non-profit entity. Some of the grantors allow individuals to apply. A complete list of potential funders and the

eligibility details to qualify grants to implement this project is beyond the scope of this document. Some of the potential implementation funders are:

- *U.S Environmental Protection Agency:* Variety of funding for improving water quality and for the improvement of wetland wildlife habitat.
- *U.S. Department of the Interior:* Offers a great variety of grants and loans for environmental improvement. Grant funds and loans related to the goals of this project are usually administered through the Bureau of Reclamation, Bureau of Land Management, or U.S. fish and Wildlife Service.
- *U.S. Department of Agriculture:* Topics are similar to those of the Department of the Interior. Administration if usually through the NRCS or the Agricultural Research Service.
- *CA Department of Fish and Game:* Improvement of wildlife habitat with focus on anadromous fisheries.
- *CA Department of Conservation:* Variety of topics related to natural resources.
- *CA Department of Forestry:* Forest improvement practices.
- *CA Department of Water Resources:* Water conservation and water quality.
- *CA State Water Resources Control Board:* Water quality, loans, and wetland habitat improvements.

A comprehensive list of agency authority and implementation programs is contained in "California's Nonpoint Source Pollution Control Program, Volume II (draft July 1999). Copies of the document may be obtained from the State Water Resources Control Board or the California Coastal Commission.

A detailed listing of many grant programs is also available through the University of California in printed copy, electronic file, or the Internet. Orders for printed or electronic files may be sent by E-mail (ncsaf@mcn.org) , telephone (707-467-8733), or FAX (707-467-0600 *51). Printed copy is $5.00, diskette $2.50, E-mail is free. The Internet site is http://ceres.ca.gov/foreststeward/funding.html.

Section 7 – RIPARIAN HABITAT IMPROVEMENTS

7.1 Site Selection:

As part of the development of this phase of the project an advisory committee with a broad range of natural resource backgrounds was formed. Four field trips were completed to get a comprehensive review and analysis of the conditions of the riparian zones, and to develop goals and objectives for any proposed restoration sites. A consensus opinion of the group was that, for the most part, all of the inland waterway corridors were in relatively good condition with the exception of the Cuyama River in the reach extending throughout Cuyama Valley. Conversely, the group also observed that there were numerous opportunities for improvement within the constructed reach of the Santa Maria River and at various constructed facilities located in the urban/agricultural interface around Santa Maria and Orcutt. The interface sites are all maintained by the Santa Barbara County Flood Control District. The sites identified in the interface area are commonly referred to as the Bradley, Blosser, California Street, and Mud Lake basins.

7.2 Cuyama River:

<u>7.2.1 Discussion:</u>

SISQUOC RIVER TO WESTERN CUYAMA VALLEY: The Cuyama River has been subject to significant hydro-modification from the western end of Cuyama Valley to its confluence with the Sisquoc River. Upstream of Twitchell Reservoir the modifications consisted of channel re-routing to accommodate the relocation of Highway 166. In the process, the river was shortened by approximately 7,300 feet in a reach of about 82,500 feet. The removal of river meanders and resultant increase in channel slope produced significant changes to the channel and flood plain resulting in accelerated erosion and sediment yield. Other than channel response and adjustment to the annual changes in stream flow and bed load, the riparian corridor appears to have somewhat adjusted to the alterations by presence of a well-vegetated riparian zone. However, the river does attempt to reclaim the historic meanders during high flows and there is frequent damage to the road system.

The river system below Twitchell Reservoir has a relatively stable environment most of the time because runoff is stored in the dam and then released under controlled volumes during the dry season or between storms in the winter. With controlled releases, the vegetation within the channel has an opportunity to grow and expand laterally because there are no high flows to scour the channel and remove excess vegetation. However, the increase in habitat also reduces the hydraulic capacity. The capacity reduction becomes particularly acute following several years of modest rainfall and runoff. Since flood control is one of the management functions in the dam operation, during extremely wet periods relatively high winter releases may be ordered to preserve storage in the reservoir. These releases are usually during intense storms and when combined with downstream runoff they can, and have, caused catastrophic damages to the riparian zone.

WESTERN CUYAMA VALLEY TO CUYAMA: From the western end of Cuyama Valley upstream to the town of Cuyama, the riverbanks are badly eroded on the outside of almost all meanders. Most of this erosion is in the form of nearly vertical escarpments that are 20 or more feet in height. This erosion is a major contributor to the sediment load in Twitchell Reservoir.

CUYAMA TO VENTURA COUNTY LINE: From Cuyama upstream to about the Ventura County line, the height from the river bottom to the top of the bank is relatively low - in some areas it is just a few feet. All of this reach is within the farming region. There are relatively frequent storm related damages to the riparian corridor and the adjacent farmlands. Modest storm events calculated as being in the 8 -15 year range of probability have caused severe damage five times in the last 20 years. Farmers have attempted to control this erosion for the past 50 years without success. In 1979 a series of levees, wire revetments and vegetative plantings were installed. These facilities were severely damaged by storm runoff in 1981, but salvageable. However, the necessary funding could not be raised and the system on the San Luis Obispo County side of the river has since been functionally lost. There have been attempts in recent years to stabilize the banks, and as recently as 1998 more sand levees were constructed. The probability of these failing is inevitable based on the history of the region.

VENTURA COUNTY LINE TO HEADWATERS: From the Ventura County line to the top of the watershed, the river has a relatively stable riparian corridor. This reach is in a much higher rainfall area than Cuyama Valley and a reasonably vegetated riparian corridor is in place. There have been some hydro-modifications associated with the construction of Highway 33, but they generally only involved hardened revetments to protect critical areas of the road and have a minor effect on the flow pattern of the river.

7.2.2 Recommendations:

SISQUOC RIVER TO TWITCHELL RESERVOIR: Down stream of Twitchell Reservoir, the private landowners are currently in the process of rehabilitating the riparian corridor which was severely damaged during the floods of 1998. This work is being conducted in cooperation with various regulatory agencies. It primarily involves mitigation for river corridor damages associated with landowner repair of infrastructure and croplands. Nevertheless, the probability of the catastrophic damages recurring in the future is high unless a plan is prepared and implemented that would include channel maintenance for hydraulic capacity. It would appear that this plan could include improved wetland habitats in addition to protecting the properties. No specific recommendation can be made until the current negotiations are completed.

WESTERN END OF CUYAMA VALLEY TO CUYAMA: The eroded reach extending from the western end of Cuyama Valley upstream to the town of Cuyama cannot be controlled unless there were some form of structural measures installed to provide toe strength for the escarpments. These devices would have to include some sort of porous device such as cables and jacks, or wire revetments that would slow stream velocities and allow sediment to drop out on the lee side. Vegetation would be extremely hard to establish because most of the area receives less than 10 inches of rain in an average year, and there is no irrigation water available to establish plants. The most western reach has some colonies of *Bacharris*, however, there are no dominant vascular plants associated with wetlands in most of Cuyama Valley. All of this area is private property. It is likely that erosion controls would be well received, but they would be cost prohibitive relative to the benefit derived since all the land is dedicated to cattle grazing. The primary benefit, if only monetary values were used, would be sediment reduction in Twitchell Reservoir - a value that would be based on extending the water storage capability of the reservoir. Several sediment basin sites were investigated as part of this project (Section 5.8). All of these sites are within the reach of concern. If they were installed they would create a substantial wetland habitat, and reduce the stream bank erosion within the pond area. The water surface areas of the sediment basins would range from 944 to1,319 acres.

CUYAMA TO VENTURA COUNTY LINE: Establishing a buffer of heavy vegetation would help to stabilize the area; however the primary native plants found in the region are *Atriplex canescens*, and *A. polycarpa.* Both are upland plants with brittle top growth that would not be very effective against high river flows. When the levee and revetment system was installed, extensive plantings of Athel (*Tamarix aphylla)* and Salt cedar (*T. pentandra)* were installed. Both plants have substantial trunk and root systems and are highly successful in preventing bank erosion when they were irrigated for an approximate two-year establishment period. However, both are listed as noxious introduced plants and are currently targeted for eradication on federal lands. Most of the land that is within the river is under the jurisdiction of the BLM so there are institutional concerns with any form of treatment. Previous discussions with the BLM and the COE indicated that they were not receptive to any artificially (irrigated) propagated plantings, nor introduction of any plants that are not native to the area. Since those discussions there have been significant damages to both cropland and the riverbanks. In response to landowner requests, the regulatory agencies did allow repair work within the streambed so they may be receptive to a plan that would principally involve improved bank vegetation on an experimental basis.

Historically there were some colonies of mature cottonwood trees along the riverbanks also in areas removed from the river. However, most of the groves not adjacent to the river are dead or dying. The likely cause is a lowering of the water table. (The species appears to be *Populus fremontii*) At higher elevations, white alders (*Alnus rhombifolia*) are common along the riverbanks. Perhaps either or both species would be acceptable for introduction since they are both found in the general area. Both plants have strong root and top growth systems that should provide bank protection. Irrigation would still be necessary to establish the plantings, and perhaps to sustain them.

The most vulnerable part of this reach is on the San Luis Obispo side of the river from approximately at the Santa Barbara/San Luis Obispo County line at Foothill Road westerly. In this reach the river as a tendency to migrate in a more northerly direction, and has done so with all recent high flows causing significant cropland damages. As an alternative, a controlled breach point and reestablishment of a floodplain meander might be considered. This concept would probably not be well received unless there was compensation for loss of cropland. However, future floods and bank erosion might dictate this alternative.

7.3 Santa Maria River:

7.3.1 Discussion:

The Santa Maria River has undergone extensive hydro-modification with the construction of a levee system that contains the watercourse for approximately 75 percent of its length. The only unaffected reach is from Highway 1 near Guadalupe to the ocean, and even that reach has a few earthen levees to protect cropland. This system was built by the COE to provide flood control protection for the City Of Santa Maria. The construction was during the same era as the construction of Twitchell Reservoir. The levees are monolithic structures consisting of sterilized earthen embankments with loose rock rip rap on the river side. On the Santa Barbara County side of the river, they are continuous from Fugler Point to Highway1. On the San Luis Obispo County side the levees start near Highway 101 and extend to a point approximately 3,500 feet upstream of Highway 1. East of Highway 101 high banks contain the river on the San Luis Obispo County side. In total, there are approximately 105,000 lineal feet of levees not including side drain systems, 80,000 lineal feet of which are on the Santa Barbara County side. The width of the river channel varies upstream of Highway 101, but in all areas it is at least 2,000 feet wide. In the reach with levees on both sides, they are uniformly spaced at 2,300 feet.

Several major side drainage ways in Santa Maria Valley have also been modified to direct flows northerly into the river. The largest hydrologic areas that are diverted are Bradley Canyon, Bradley Channel, Blosser Channel, West Main Drain and Bonita School Road Drain.

The Bradley Canyon diversion intercepts a natural stream approximately 6.8 miles east of Santa Maria. All of the water contained is runoff primarily from irrigated agricultural land. There are some residual summer flows because of tailwater produced from gravity flow irrigation systems.

The Bradley Channel is a flood control conveyance system that intercepts most of the agricultural runoff between Bradley Canyon and Highway 101 in Santa Maria. It also serves as a drain for the urban area east of Highway 101 and part of the urban area located west of Highway 101 in the proximity of the river. This channel eventually merges with the Blosser Channel. There are nominal year-round flows as a product of agricultural tailwater.

The Blosser Channel intercepts runoff from most of the City of Santa Maria. It is directed to storage and percolation basins that were formerly gravel mining pits. At that point, water is merged with runoff collected by the Bradley Channel and continued in an earthen channel to the Santa Maria River.

The West Main Drain is located approximately 3.4 miles west of the Santa Maria City limit. It collects agricultural runoff generated north of West Main Street and west of the city. This drain usually has some year-round flow because of agricultural tailwater.

The Bonita School Road drain operates similarly to the West Main Street drain in that it intercepts agricultural runoff that is generated north of West Main Street. It is located approximately three miles west of the West main Street drain.

All of the constructed waterways are maintained by the FCD through a Memorandum of Understanding with the COE including levees located on the San Luis Obispo County side of the Santa Maria River. The counties have a 200-foot right-of-way that includes 130 feet on the river side of the levees and 70 feet on the field side. They also have an easement to conduct maintenance activities throughout the river channel.

During the era when the conveyance systems were constructed there were no requirements for environmental mitigation and sterilization of the levees is by prescription in the MOU between the COE and the FCD. Consequently, the vegetation in the river corridor is all volunteer growth and varies from sparse upland plants to dense high value wetlands. The river rarely maintains a straight course because of the channel width. Instead it meanders and bounces off the levees resulting in damage to both the riparian covers and the levees. In the few reaches that have dense wetland riparian covers next to the levees, the damages are usually minor. Conversely, areas without established cover sustain significant damages including undermining of the rock rip rap.

7.3.2 Recommendations:

It is recommended that a linear corridor of vegetation be established adjacent to the levees on the stream side of the channel on the Santa Barbara County side of the river from Highway 1 upstream to the end of the levee system at Fugler Point and on the San Luis Obispo County side from Highway 1 to Highway 101. This riparian cover would be approximately 105,00 lineal feet, 80,000 of which would be on the Santa Barbara County side of the river. The minimum width would be 50 feet. A total of approximately 120 acres of habitat would be created.

The corridor would consist of native plants, for the most part, harvested from existing colonies located at various reaches in the river. The primary plantings would be made from cuttings taken from various species of willows and Mulefat (*Baccharis glutinosa*). In order to provide diversity other woody plants associated with wetlands such as cottonwood, sycamore, and alders would be included in the planting scheme. Some of the secondary plant species may have to harvested from other watersheds or purchased as container plants because of limited supplies in the Santa Maria River. The under story would not be planted to reduce competition and maximize survival and growth of the woody plants. Natural introductions of prostrate growing woody plants or non-vascular plants associated with the habitat type would be expected to occur.

Six agricultural tailwater drains enter the river in the reach of concern. All are nutrient rich, particularly in nitrate content. Sprinkler irrigation systems would be installed to target this water to the planted areas. Irrigation would continue for at least two years to ensure plant establishment. Under current conditions, much of this water is in discrete channels that eventually percolate directly into the groundwater system. Since the new plantings would filter and absorb most of the nutrients, it may be advantageous to continue the irrigation after two years to improve groundwater quality.

No land purchases or right-of-ways would be required because all of the plantings would be on County owned land. The planting plan would be concurred upon by the   F & G, FWS, COE, and others with interest in the project. An important component of the plan would be an agreement to allow some vegetation mowing in the lower watershed for flood control purposes in exchange for the habitat increases. At present, flood control is a difficult process because the lower reaches in the river are considered as important habitat for the endangered Willow Flycatcher. In addition to creating additional habitat for the Willow Flycatcher, this plan would greatly enhance the riparian corridor by providing a heavily vegetated link between the coastal zone and the interior uplands. It would also provide a buffer to protect the banks and levees from the forces of the river, create opportunities for wildlife viewing, and provide an outdoor educational opportunity for the public. Recently the FCD and the City of Santa Maria reached an agreement whereby some of the levee system would be open for use as a bike path and hiking trail. The plantings would greatly enhance the esthetic values.

7.4 Bradley Basins:

7.4.1 Discussion:

The Bradley Basins consist of two facilities connected in tandem that serve as surge basins for flood control. They are located adjacent to the northbound lanes of Highway 101 approximately 0.5 miles south of the Santa Maria River bridge. As stated previously, they collect water from both agricultural and urban runoff. During the dry season months, there is enough agricultural tailwater to sustain the ponds at maximum pool. Overflows continue through a flood control channel to the Blosser Basins and ultimately to the Santa Maria River. Until recently the surrounding area was in native cover and used for occasional cattle grazing; however, it is rapidly becoming urbanized. The gross area is ///// acres, ////// of which is open water. Water depths range up to approximately ////// feet. There are patches of cover located at or near the waterlines; however, transitional cover and upland cover is lacking.

7.4.2 Recommendation:

Although there is urban encroachment, the area is still used somewhat by waterfowl and various upland birds. The area could be improved by introducing additional cover for nesting, escape cover and food from the waterlines inland for approximately ten feet. Upland plants consisting of native trees and shrubs would be planted throughout the margins of the area to the extent that they do not interfere with FCD maintenance activities. Nesting boxes for wood ducks, Barn owls, and bats should be included with the habitat plan. Bat boxes would be particularly useful in controlling the mosquito populations.

As an alternative, this parcel might be considered for development as a water-based recreational facility such as fishing. It is unlikely that water contact would be permitted because of the water depth and liability concerns. The ponds would likely support a warm water fishery if the take were controlled. They might also support "put and take" trout fishing when the water temperatures were cool enough for trout survival.

7.5 Blosser Basin:

7.5.1 Discussion:

The Blosser basin is located at the end of Blosser Road on the northern end of the City of Santa Maria. It is approximately one-half mile south of the Santa Maria River. In the year 2000 the site consisted of approximately ///// surface acres of potential open water and //// acres of upland. However, the FCD was in the process of negotiating the acquisition of an abandoned gravel pit that is adjacent to the current facilities. This pit would enlarge the site to ///// acres. The amount of additional wetland is unknown because the facility design has not been completed. The tentative plan is to connect the gravel pit with the existing basin through weir flow and use the gravel pit as floodwater storage and as a percolation pond. Although the pit bottom is largely composed of sand and gravel that initially would facilitate rapid percolation to groundwater, some maintenance would be required because this type facility typically seals to some degree because of an accumulation of silt and clay particles so there will likely be extended periods with open water.

As stated previously this facility collects water from the Bradley Channel and the Blosser Road Channel. All flows in the Blosser Channel are from city runoff. The flows from the Bradley Channel include both agricultural and city runoff. The basin is operated as a floodwater surge control. The current design allows flows up to ////// cfs in each channel to be piped around the basin and ultimately discharged into the Santa Maria River. Flows above ///// cfs are diverted by a baffle through concrete weirs into the storage basin. After the stored water reaches a certain elevation it to is diverted and discharged to the Santa Maria

River. During the dry season, there is little or no flow in the Blosser Channel. Conversely, the Bradley Channel has some residual flows year-round from agricultural tailwater. This tailwater would be an important source for irrigation of the Santa Maria River plantings. Stored water from storm runoff would be available to irrigated plants within the basin complex in most years.

7.5.2 Recommendations:

In the year 2000, the site was at the urban/agricultural interface; however, all of the cropland on the north boundary is scheduled for sub-division. Nevertheless, the site has much potential for development into high quality habitat. Improvements would be similar to the Bradley basin, but on a much larger scale. The exact scope and configuration of the habitat plan would have to be made after the FCD determines the method by which the gravel pit will be incorporated into the complex, and the operational procedures for maintenance of the facilities.

This site would have marginal potential as a warm water fishery because there are no year-round flows to sustain the water levels. In addition, the basin must be dried periodically to remove sediment. It would probably support a limited put and take trout fishery, but the apparent best use is for a safe harbor habitat for wildlife, and an outdoor educational facility. Under any circumstance, the area would require a security fence to prevent vandalism and reduce depredation from domestic and feral dogs and cats.

7.6 California Street Basin:

7.6.1 Discussion:

The California Street Basin, as the name implies, is located adjacent to the street. It is on the upstream side (east) and adjacent to the north boundary of the community of Old Orcutt. This basin is within Orcutt Creek, and the primary function is to capture sediment. The sediment bed load in the creek is high so the facility must be cleaned on a frequent basis. Stream water is only present for short periods during winter runoff. Immediately upstream of the basin there is a dense canopy of riparian cover; however, such cover is lacking in the general area surrounding the basin. The area owned by the County is approximately ////// acres.

7.6.2 Recommendation:

Approximately ///// acres around the basin could be improved with plantings of native upland vegetation. This would provide an important link to existing riparian cover both up and down stream of the facility. There would be some hazard to wildlife traversing the corridor because of the need to cross California Street. Water to establish the plants would have to be from metered municipal supplies or trucked in. The installation of animal nesting boxes should also be part of the habitat improvement.

7.7 Mud Lake Basins:

7.7.1 Discussion:

The Mud Lake Basins are located in the eastern part of Orcutt approximately 0.3 miles south of Highway 101, and 0.4 miles north of Clark Avenue. The north and east boundaries are formed by Santa Maria Street and Kenneth avenue, respectively. The complex consists of three basins whose primary function is to store winter runoff and reduce the probability of downstream flooding. All basins are at different spillway elevations. One basin accepts urban runoff flowing from north to south. This is a relatively small hydrologic area so there is usually only modest flows that percolate and evaporate rapidly when they are contained in the basin. The other two basins are constructed within the same drainage. The hydrologic area includes agricultural runoff from the eastside of Highway 101 and urban runoff from the developed west side. The upper most of the two basins normally has some residual flow during the dry season. The source is unknown, but likely from urban over watering of lawns because the agricultural area is sprinkler or drip irrigated with no measurable runoff. This runoff has created an excellent wetland habitat in the upper basin, but most of the water is consumed by plants before it reaches the lower basin. The lower basin is the deepest, and has the largest surface area so there is usually a sustained period during the summer when there are enough winter rains to produce runoff. In most years, there is usually sufficient water available for waterfowl throughout the nesting season.

The entire complex is ///// acres. The surface water area varies considerably with the seasons and the rain year but it averages about ///// acres. The north basin is primarily dominated by annual grass, and there is little opportunity for improvement within or immediately adjacent to the facility. The upper basin in the main drainage way has suitable wetland habitat but lacks transitional and upland cover. The lower basin is primarily surrounded by annual grass.

7.7.2 Recommendations:

The area currently has relatively extensive use by waterfowl and other animals. It could be improved by the addition of escape and nesting cover, and perhaps the introduction of wetland plants to improve food resources in the lower basin. Other improvements would include the addition of animal nesting boxes. This area has a good security fence to protect the area from vandalism and depredation from feral and domestic animals. It would could also serve as an outdoor educational facility since it is only several hundred yards from Ralph Dunlap School.

7.8 Other Sites:

One of the strategies suggested to reduce sedimentation in Twitchell Reservoir was to determine the feasibility of constructing one or more large sediment trap basins in the upper Cuyama River. If any of these projects prove economically feasible to construct, they would create extensive wetland habitats. These habitats could be used exclusively for wildlife, or a variety of water based recreational activities such as fishing, boating, and waterfowl hunting.

The historic Betteravia Lake is a natural depression within Orcutt Creek. At maximum pool, the surface area is 974 acres. This lake is traditionally drained after each winter season for agricultural purpose. The frequency of flooding has increased substantially in recent years because of the rapid urbanization and resultant increase in runoff. At the rate urbanization is occurring it may become economically infeasible to continue the draining because of the energy costs, and the relatively short growing season available after the soil dries sufficiently for planting. If that circumstance should occur, reclaiming the area as a wetland may be the best future use of the land.

APPENDIX A – Reference Documents

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APPENDIX B – Acronyms and Abbreviations

ACRONYMS:

BLM – Bureau of Land Management
BMP – Best Management Practice
CES - University of California Cooperative Extension Service
CIMIS – California Irrigation Management Information System
COE – U.S. Army Corps of Engineers
CWA – Clean Water Act
CZARA – Coastal Zone Reauthorization Amendment
DOC – California Department of Conservation
DU – Distribution uniformity
DWR – California Department of Water Resources
EPA – U.S. Environmental Protection Agency
F & G – California Department of Fish and Game
FCD – Santa Barbara County Flood Control District
FWS – U. S. Fish and Wildlife Service
GIS – Global Information System
IPM – Integrated Pest management
LPNF – Los Padres National Forest
M & I – Municipal and industrial
MPD – Mount Pinos Ranger District
MSL – Mean sea level
NPS – Non-point source
NRCS – Natural Resources Conservation Service
RCD – Cachuma Resource Conservation District
RWQCB – Regional Water quality Control Board
SLD – Santa Lucia Ranger District
TAC – Technical advisory committee
TMDL – Total Maximum Daily Load
UNOCAL – Union Oil Company of California
USDA – United States Department of Agriculture
USDI – United States Department of Interior
USFS – United States Forest Service
USGS – United States Geological Survey
WA – Santa Barbara County Water Agency
WCD – Santa Maria Valley Water Conservation district

Abbreviations

μg/l – Micro-grams per liter
Ac-ft – Acre feet
BOD – Biological oxygen demand
cfs – Cubic feet per second

EC – Electrical conductivity
ET_c – Evapotranspiration of a crop
ET_o – Reference evapotranspiration
JTU – Jackson turbidity units
me/l – Milli equivalent per liter
mg/l – Milligrams per liter
ml – Milliliter
Mmhos/cm – Millimhos per centimeter
MSL – Mean sea level
pH – Relative acidity or alkalinity
ppm – Parts per million
TDS – Total dissolved solids