WATER PLANNING AREA #7 -- CUYAMA

WPA 7 encompasses the portion of San Luis Obispo County that lies within the Cuyama River watershed (i.e. Twitchell Reservoir).

DEMAND

The development of demands for the San Luis Obispo (SLO) MWP Update involved collection and analysis of four types of existing data: 1) urban demand; 2) agricultural demand; 3) rural demand; and 4) environmental demand. Following the review of existing plans and data, existing demands for each of the four categories were prepared for each of the 12 WPAs. Next, data regarding growth and future water use was analyzed to develop a preferred approach for the development of future water demands. These future demands were then prepared and projected by the same four demand categories for each of the WPAs.

The total existing and future demands for WPA 7 are listed in Table 1. A discussion of demands by each category follows.

Table 1
WPA 7 Demand Totals by Category[a]

Category of Demand	Existing Demand (ac-ft/yr)	Projected Demand (ac-ft/yr)
Urban	0	0
Agricultural	18,890	16,820-20,490
Rural	420	490
Environmental	NA	NA
Subtotal	**19,210**	**17,310-20,980**

a. All figures have been rounded to the nearest 10's.

Urban Demand

There is no Urban Demand for the purposes of this study.

Agricultural Demand

This section documents existing and projected Gross Irrigation Water Requirements (GIWRs) for WPA 7. The existing and projected demand figures relied upon published data and accepted methods, along with information gathered from extension agents, consultants, growers, and irrigation specialists. Tables 2 and 3 summarize the current and projected agricultural water demands for WPA 7. Anticipated changes in the future cropping acreage in the Cuyama WPA include an increase in vegetable and deciduous crops. Changing crop patterns combined with changes in irrigation efficiency contribute to a fairly steady agricultural water demand.

Table 2
Existing GIWR for WPA 7 (AF/Yr).

Annual Gross Irrigation Water Requirement (AF/Yr)		
Low	**High**	**Average**
16,597	20,517	18,887

Table 3
Projected GIWR for WPA 7 (AF/Yr).

Low	High	Average
16,819	20,485	18,652

Procedures and Concepts

Estimating GIWR for local conditions can be characterized by the following general formula:

$$\text{GIWR} = \frac{\text{Crop ET} - \text{Contrib. from rain or shallow water table}}{(1 - \text{Leaching Requirement}) \times \frac{\text{Irrigation Efficiency}}{100}} + \text{Climate Control}$$

This analysis must be completed for each crop group, acreage, and weather pattern to calculate total GIWR (in AF) by WPA.

Cropping Patterns

Table 4 summarizes estimates of irrigated cropping acreage for WPA 7

Table 4
Estimated cropping acreage for WPA 7

Alfalfa	Permanent		Veg.	Total
	Citrus	Decid.		
600	0	2,200	2,000	4,800

Source: Estimated from annual crop report, county GIS records and pesticide use records.

Crop Evapotranspiration

Several UC Cooperative Extension Leaflets describe estimating crop evapotranspiration (ETc) where:

ETc = ETo x Kc

ETc is estimated by multiplying the weather factor (ETo) with the crop coefficient (Kc). ETo values for the Taft climate group (51.2 in/yr) were assigned to WPA 7 and Kc values are specific to the crop groupings (see Chapter 2). Yearly ETc totals for WPA 7 are summarized in Table 5.

Table 5
Yearly crop evapotranspiration (ft) for each crop group in WPA 7

Alfalfa	Permanent		Vegetable
	Citrus	Decid.	
3.7	NA	3.3	1.6

Effective Rainfall

WPA 7 was assigned the Shandon rainfall group (10.5 in/yr) for the purpose of estimating effective rainfall (See chapter 2). Ranges of percentage of effective precipitation were applied to the crop groupings in WPA 7 and are listed in Table 6. Higher percentages were assigned to the deeper rooted crops according to their larger rootzone water holding capacity.

Table 6
Assigned ranges of typical effective precipitation for crop groups in WPA 7

Crop Group	Effective Precipitation Range (%) [1]	
	Low	High
Alfalfa	40	60
Permanent		
Deciduous	40	60
Vegetable [2]	15	25

1. As a percentage of total annual rainfall.
2. 2x adjustment factor for multiple cropping.

Frost Protection

Irrigation water is commonly applied for frost protection on strawberries in WPA 7. The amount of water used for frost protection varies from season to season depending on the weather, and it varies from farm to farm depending on the system application rate. For the purpose of calculating applied water, 0.8 AF/Ac/Year is utilized for the water applied for frost protection on strawberries

Leaching Requirements

The amount of extra irrigation water, which needs to be applied to satisfy the leaching requirement for a particular crop, depends on the salt tolerance of the crop and the irrigation water quality. Ground water quality in San Luis Obispo County is typically adequate for crop production and does not necessitate additional *irrigation* water applied for leaching since it is typically satisfied by normal rainfall. Chipping et al. 1993 reports that of the wells tested in the Paso Robles Ground Water Basin Study, most of the wells tested have EC levels < 1.0 dS/m. Given these water qualities and salt tolerances typical with central coast crops, leaching requirements would be satisfied by rainfall.

Irrigation Efficiencies

Irrigation efficiency can be expressed by the following relationship:

$$\text{Irrigation Efficiency} = \text{Distribution Uniformity} \times (1 - \text{Losses})$$

The Cachuma Resource Conservation District routinely conducts irrigation evaluations in Santa Barbara and San Luis Obispo Counties and are excellent resource in describing the actual performances of irrigation systems in the region. Irrigation efficiencies were assigned to crop group according to prevalent irrigation system type and knowledge of typical local uniformities (Table 7).

Table 7
Assigned irrigation efficiency averages for each crop group in WPA 7

Crop Group	Irrigation Efficiency Range (%)	
	Low	High
Alfalfa	60	70
Permanent	60	70
Vegetable	65	75

Existing Gross Irrigation Water Requirement by Crop Group
Existing GIWRs for WPA 7 are summarized in Tables 8. The ranges provided in Table 7 do not represent the extremes in GIWR, but do represent the typical ranges in a normal year given local variations in effective precipitation and irrigation efficiencies. Table 2 summarizes the current agricultural water demands for WPA 7.

Table 8
Summary of Existing GIWR for WPA 7 by crop group (AF/Ac/Yr)

Alfalfa		Permanent-Deciduous		Vegetable	
Low	High	Low	High	Low	High
4.5	5.5	4.7	5.8	1.8	2.2

Future Gross Irrigation Water Requirements by Crop Group
Several issues would affect changes in future irrigation water requirements:

- Changes in cropping acreage and type of crop
- Changes in irrigation methods

Cropping Patterns

Trends in cropping patterns were examined through historical crop reports and previous water use projections completed by the Department of Water Resources. Table 9 summarizes projected crop acreages in WPA 7.

Table 9
Projected cropping acreage for WPA 7

Alfalfa	Permanent		Veg.	Total
	Citrus	Decid.		
600	0	2,500	2,300	5,400

Irrigation Methods

Table 10 reflects the projected irrigation efficiencies by crop group in WPA 7.

Table 10
Projected irrigation efficiencies by crop group in WPA 7

Crop Group	Irrigation Efficiency Range (%)	
	Low	High
Alfalfa	60	70
Permanent	70	80
Vegetable	70	80

The same procedures that were utilized to calculate existing agricultural demands were utilized in estimating projected irrigation water requirements. The projected values reflect the changes in cropping acreage and irrigation efficiencies. Table 4 summarizes the projected agricultural demands for WPA 7.

Table 11
Summary of Projected GIWR by crop group for WPA 7 (AF/Ac/Yr)

Alfalfa		Permanent-Deciduous		Vegetable	
Low	High	Low	High	Low	High
4.5	5.5	4.1	5.0	1.7	2.1

Rural Demand

Rural water demands in the Cuyama WPA include dwelling units scattered throughout the hills and valleys, especially in the Cuyama Valley area. The commercial areas of Cuyama are not included in Tables 12 and 13 below. Water is produced in private wells from the groundwater basin in the area.

Table 12
Current Demand – 1995

Population	Pop/Du	Houses	Duty (ac-ft/ac)	Demand[a] (ac-ft/yr)
708	2.86	248	1.7	320

a. Demand figure has been rounded to the nearest 10's.

Table 13
Projected Demand – 2020

Population	Pop/Du	Houses	Duty (ac-ft/ac)	Demand[a] (ac-ft/yr)
820	2.86	287	1.7	490

a. Demand figure has been rounded to the nearest 10's.

Data Deficiencies
The following additional data would improve the accuracy of this study:

- **Commercial**. A few commercial activities exist in the rural areas that were not accounted for in the urban demand. It represents a very small percentage of the total water used. Cuyama and New Cuyama are perhaps the largest unaccounted commercial demand in the rural area and should be added to the total.

- **Dwelling Units**. The study was based upon population numbers, with an estimate of dwelling units derived from population figures divided by persons per household. Demand should be based upon a count of dwelling units by WPA. This information would be derived from assessor data.

- **Certificate Lots**. Many parcels of land in the area may be buildable. It is difficult to ascertain how many will be built upon.

Environmental Demands

Current Demands

Information on current environmental water demands is available from two sources: 1) conditions on water rights permits and licenses and associated orders on file with the State Water Resources Control Board, and 2) agreements between the California Department of Fish and Game and other entities. There are no current environmental demands, as reflected in water rights and regulating agreements, for WPA 7.

Future Demands

The CDFG is currently developing a protocol for determining stream flow needs to protect environmental values (Waithman, CDFG, Yountville, personal communication, February 1998). This protocol is under development and has not been formally accepted or even formally proposed. It is presented here to indicate one estimate of possible future demand. This protocol has not been adopted by CDFG and if it were, other groups or agencies may not accept it. Key provisions may include the following:

- Reservation of 60% of the average annual unimpaired wet-season flow for instream habitat.
- Bypass of all natural flow during dry season (June to September).
- No diversions until stream flows to the ocean (sandbar breached).

WPA 7 is dryer than the other WPAs and many streams are dry seasonally or during drought periods. None of the streams in this area support steelhead, resident rainbow trout, or other protected fish species. Many of the smaller streams probably do not support fish though western pond turtle, red-legged frog, and other aquatic dependant species may use ponded areas even during low flow periods. Stream flow is highly variable and runoff tends to be rapid after rainfall events. Future environmental water demand may be as low as 0 in drought years (similar to existing conditions). Based on the fact that these streams do not support protected fish species and given their intermittent nature the upper estimate for environmental water demand was relaxed to 60% of unimpaired average annual runoff.

Data Deficiencies

There has been no organized complete effort to quantify instream flow needs in streams of San Luis Obispo County. Studies have been conducted on some streams and restrictions have been placed on certain water rights permit holders to protect instream uses but these have generally focused on the needs of one or a few key species and have not resulted in clear, objective assessments of instream flow needs.

There is not sufficient data to complete a detailed analysis of environmental water demands for all streams in the County. There is no known data for unimpaired runoff for any stream though it is possible estimates could be developed from available rainfall data. The only readily available (electronic) data is from USGS and County maintained streamflow gaging stations. The USGS data presents average runoff estimates as well as minimum and maximum runoff for each station but this data reflects existing water use and water project operations and in most cases does not reflect unimpaired conditions. Average runoff estimates could also be developed for the SLO gage data and discontinued USGS gages but the information would need to be in an accessible database.

A generic approach to instream flow needs assessment may be useful and data for such an assessment may be available. The County should consider a Tennant type approach using unimpaired runoff estimates generated from rainfall data. Given the wide annual variability

in rainfall and runoff, an instream flow needs assessment should account for differences in normal, wet, and dry year flow needs. The County should also have all streamflow data entered in a computer database to facilitate its use.

Uncertainties

In many cases permit or license conditions do not specify a reservation of stream flow for environmental benefit. Rather, they are restrictions on use by individual rights holders. These restrictions are intended to provide benefits to fish and wildlife. However, it is not usually clear how restrictions on an individual water right interact with other water rights and effect streamflows. In addition, it is not always clear how permit conditions are interpreted in terms of an environmental demand. For example, many of the permit conditions call for a "visible surface flow" in a given stream but it is not clear how much water this represents.

Future environmental water demand is subject to great uncertainty due to lack of knowledge of instream flow needed to protect the aquatic resources, lack of information on existing runoff conditions and diversions, and the inherent annual variability in rainfall and runoff. For planning purposes, one could assume that the upper range of future demand will be defined by a percentage of the average annual unimpaired runoff (UAAR) during the wet season and no diversion during the dry season. This task is complicated since many streams are not gaged streams and unimpaired flow must be estimated using hydrologic modeling. This information is not presently available.

References

Stalnaker, C., B.L.Lamb, J. Henriksen, K. Bovee, and J. Bartholow. 1995. The Instream Flow Incremental Methodology: A primer for IFIM. Biological Report 29. U.S.D.I., National Biological Survey, Washington, D.C.

SWRCB, 1997. Staff Report Russian River Watershed. Proposed Actions to be taken by the Division of Water Rights on Pending Water Right Applications within the Russian River Watershed. Division of Water Rights. Sacramento, California

SUPPLY

Water service to the Cuyama area is provided by small isolated water systems that lack interties.

Groundwater Supply

Table 14 lists the ground water basins in WPA 7. Estimates of "basin yield" are provided for those basins that have been studied, coupled with estimates of ground water production. An estimate of annual ground water production is provided on the table, along with the year representing the estimate and a reference to the source of information.

Within WPA 7, the Cuyama ground water basin is upstream of the Santa Maria ground water basin. The Cuyama Basin which is also within Santa Barbara County is in an overdraft condition according to the DWR. Studies in the area include those by the US Geological Survey and the Department of Water Resources. Water management issues in this area relate to pumping costs and salinity of the ground water.

Table 14
WPA 7 Ground Water Basins

WPA	Basin Name	Basin Area in Square Miles	Basin yield with original descriptive term in acre-feet per year	Production - year in acre-feet
7	Cuyama	230 (12)	8,000 safe yield (15)	48,700 –1,992 (15)

12. California Department of Water Resources, 1975, California's Ground Water: Bulletin 118.

15. County of Santa Barbara Planning and Development Department, January 1995, Environmental Thresholds and Guidelines Manual.

Data Deficiencies

It is important to note that most of the basins have not been studied in detail, and true perennial yield values are not known. Thus, much of the information does not reflect current conditions, population, water usage, and agricultural trends. It also tends to point out the necessity of developing new data to more accurately describe the hydrologic conditions of the basins. Most of the estimates of ground water extraction are at least 10 years old.

Uncertainties

The "basin yield" values described in the table reflect the results of a variety of methods of determining yield, including annual recharge, safe yield, seasonal replenishment, and net safe annual extractions, and thus may or may not reflect an accurate perennial yield value for the basin.

Surface Water Supply

Ground water is the predominant source of water supply in WPA 7. Surface water yield is assumed to be 0 AF for the purposes of this study.

DEFICIENCIES

Cuyama is mostly agricultural. An important issue in this area is matching supply with demand.

Table 15
Existing (ac-ft/yr)

Demand	Grndwater Supply	NonGrndwater Supply	Total Supplies	Balance[a] (Deficiency)
18,887	8,000	0	8,000	(10,890)

a. Balance (Deficiency) figure has been rounded to the nearest 10's.

Table 16
Projected (ac-ft/yr)

Demand	Grndwater Supply	NonGrndwater Supply	Total Supplies	Balance[a] (Deficiency)
16,819-20,485	8,000	0	8,000	(8,820)-(12,490)

a. Balance (Deficiency) figure has been rounded to the nearest 10's.

ALTERNATIVES

No future water supply options were considered for the purposes of this study.