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8.1.1 Affected Environment: Agricultural Land And Water Use

8.1.1.1 All Regions

The CALFED study area represents an important agricultural region for both California and the United States. California is the most diversified agricultural economy in the world, producing more than 250 crop and livestock commodities. The study area encompasses approximately 85 % of total California irrigated land, covering all or portions of 39 of the 58 counties in California. In 1995, the 39 counties together contributed about 95 % of California's agricultural production value and represented nine of the top 10 agricultural counties in California and seven of the top 10 counties in the nation. Agriculture in the study area is also an important employer and affects the regional economy through the expenditures of farmers and the processing and transportation of crops harvested.

Agricultural Land Use. The Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) distinguishes among four basic designations of farmland: Prime Farmland, Additional Farmland of Statewide Importance, Unique Farmland, and Additional Farmland of Local Importance. Prime and Additional Farmland of Statewide Importance may currently be used as cropland, pastureland, rangeland, forest land, or other land but not urban built-up land or water.

Prime Farmland is land best suited for producing food, feed, forage, fiber, and oilseed crops, and also is available for these uses. Prime Farmland has the soil quality, growing season, and moisture supply needed to produce sustained high yields or crops economically when treated and managed (including water management) according to modern farming methods.

Additional Farmland of Statewide Importance is land other than Prime Farmland with a good combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and also is available for these uses.

Unique Farmland is land other than Prime and Additional Farmland that currently is used for the production of specific high-value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to produce sustained high-quality and/or high yields of a specific crop when treated and managed according to modern farming methods. Examples of such crops are citrus, olives, avocados, fruit, and vegetables.

Additional Farmland of Local Importance is land used for the production of food, feed, forage, fiber, and oilseed crops, even though these lands are not identified as having national or statewide importance. These lands are identified by a local committee made up of concerned agencies that review the lands under this category on at least a 5-year basis.

Table XXX ***(new table)*** shows estimated totals of 1994 important farmland acreage based on information from the California Department of Conservation (DOC), Farmland Mapping and Monitoring Program for counties within the Central Valley. The numbers are estimates of important farmland acreage (including prime and unique farmland and farmland of local and statewide importance) in the Delta, Sacramento River and San Joaquin River regions, the regions where important farmland is most likely to be affected. (It is important to note that several of the counties in the study area have not been completely surveyed by DOC for important farmland and that these summaries have been approximated. For a detailed discussion of the Farmland Mapping and Monitoring Program and acreages by county, visit DOC's internet website at http://www.consrv.ca.gov/olc/farmland.html.)

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Region	Acres
Delta	520,000
San Joaquin	4,750,000
Sacramento	2,160,000

Table xxx. Title

Table XXX ***(this should be table 6 from Affected Env. Report)*** identifies approximate acres in irrigated agriculture for each of the five CALFED regions. Please see Chapter 5 for a breakdown of CALFED Program footprints and estimates of important farmland potentially affected by the Program.

Agricultural Water Use. Agriculture in the five CALFED study regions receives irrigation water from the CVP, the SWP, local water rights and water projects, and groundwater. Most of this water is delivered to farmers through irrigation districts and other water agencies. In CA, the avail. & reliab. of supply of high quality water limits the productivity of important ag land.

Table 5 provides agricultural water use and water pricing in all CALFED regions from 1985 to 1990.

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(Insert Text Box briefly describing the difference between applied water and net water demand; and reference to a more detailed discussion of the subject in the Water Use Efficiency appendix)

Central Valley Project. The CVP supplies about 30% of total agricultural water use in the study area. Most of CVP water is delivered to the Central Valley counties in the Sacramento River Region and the San Joaquin River Region. CVP water is delivered to approximately 250 water districts, individuals, and companies through water service contracts, Sacramento River water rights, and San Joaquin River exchange contracts. The terms "water service contract" and "project water" refer here to water developed by the project and delivered pursuant to repayment and water service contracts. CVP exchange contracts and Sacramento River water rights represent water rights that predate the CVP.

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State Water Project. The SWP supplies about 10% of total agricultural water use in the CALFED study area. Through contracts with 29 water agencies, the SWP provides water within the Central Valley to Butte, Solano, Kings, and Kern counties; outside the Central Valley to several Southern California counties; to Alameda and Santa Clara counties in the South Bay Area; and to Napa and Solano counties in the North Bay Area. In addition, the SWP provides water rights deliveries to water rights holders along the Feather River (Butte and Plumas counties).

Local surface water. Local surface water supplies (those not delivered by either project) provide about 40% of all agricultural water supplies in the study area. More local surface water supplies are available on the east side of the valley because of the larger amount of precipitation in the Sierra Nevada. Locally owned water projects are especially important on the Yuba, Stanislaus, Tuolumne, Kings, and Merced rivers; but local sources on the west side like the federal Solano Project also are important.

Groundwater. Groundwater provides a significant supply of water for agriculture in normal years, and it is often used to reduce or eliminate shortages of surface water supplies during drought. On average, groundwater provides about 20% of total agricultural water use in the study area.

Declining groundwater tables, subsidence, and loss of aquifer storage continue to be costly problems, particularly in the western and southern parts of the San Joaquin River Region and the Bay Region, where less surface water is available. Declining groundwater tables increase pumping costs. The costs of subsidence include damage to structures, failure of well casings, and frequent surveying. Water from the CVP and SWP had replaced some of the groundwater pumping, and withdrawals were about equal to estimated recharge (Bertoldi et al. 1991). However, the recent drought and supply restrictions imposed by the CVPIA of 1992, the Bay-Delta Accord, and

Biological Opinions have reduced surface water supplies and renewed the past trend of groundwater depletion throughout the valley.

~~Cropping Patterns~~ -

Agricultural Habitats. Croplands, orchards and vineyards have been developed on some of the State's most fertile soils. Soils which supported native flora, productive natural habitats, and a much greater diversity of species historically than they do today. Many wildlife species have adapted to croplands and continue to thrive. Wintering waterfowl and shorebirds consume waste grains left in fields after harvest, and fields flooded for weed control, leaching, and creation of seasonal wetlands. For a more detailed discussion of the types and value of agricultural habitats and seasonal wetlands see Chapter 7, Vegetation and Wildlife and the Ecosystem Restoration Plan Appendix *(do we have a number or letter yet?)*

8.1.1.2 Delta Region

Historical Perspective. Agriculture in the Delta Region began in the mid-1800s, consisting primarily of dryland farming or irrigated agriculture from artesian wells, groundwater pumping, and creek side diversions. Extensive Delta development began in late 1850, when the Federal Swamp Land Act promoted converting swamp and overflow lands to agricultural production. During the early 1900s, a series of levees and human-made waterways were developed to enhance future agricultural and urban development. Between 1920 and 1950, irrigated agriculture development increased rapidly from 2.7 million acres to over 4.7 million acres for the entire Central Valley.

Between 1976 and 1993, the total amount of agricultural land in the legal Delta was reduced by about 14,500 acres, almost all of which occurred in the Delta Secondary Zone. ***This was largely due to conversion of agricultural land to urban uses in the Brentwood and Oakley areas of Contra Costa County, the Pocket area in Sacramento County, the West Sacramento area in Yolo County, and the Stockton and Tracy areas in San Joaquin County.***

Existing Conditions

Agricultural Land Use. Today, of the ~~more than~~ 700,000 acres in the legal Delta, about 500,000 acres are ~~rich~~ farmland. Most of this area is classified as prime farmland, unique farmland, locally important farmland, or as having high statewide significance for agricultural production. The Delta's rich peat and mineral soils support several types of agriculture (DWR 1993b).

Peat Soil Loss. ***One of the unique problems with organic/peat soil is that when it is exposed to aerobic conditions by farm cultivation it oxidizes and erodes away. This has led to a drop in land surface elevations several feet below sea level throughout much of the Delta from historical levels at or above sea level. For a more thorough discussion of this unique problem see the Geology and Soils section in Chapter 6.***

Agricultural Water Use. Most agricultural water users in the Delta are private water right holders. Local water rights water accounts for over 85% of the total irrigation water use. Other irrigation water sources in the Delta Region are CVP water and groundwater, each accounting for about five to ten percent of the total agricultural water uses. Between 1985 and 1990, compared with other parts of California, the cost of water was much cheaper in the Delta Region because of large amounts of local riparian and pre-1914 appropriate water rights.

8.1.1.2 Bay Region

Historical Perspective. Between 1946 and 1950, orchards were by far the most important crop in the Bay Region, accounting for 47% of the total irrigated acres.

Existing Conditions

Agricultural Land Use. Prior to the 1940s, land uses in the Bay Region were principally urban in the city of San Francisco and rural in other portions of

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the region. Over the last 50 years, however, land uses throughout the Region have become progressively more urbanized. Approximately 240,000 acres of irrigated agricultural land remain in production, most of which are in Contra Costa, Solano, and Sonoma counties.

Agricultural Water Use. Over 75% of irrigation water sources in the Bay Region are from groundwater pumping. Local water and project water make up the other 25%. Groundwater extractions commonly exceed groundwater replenishment, therefore, many of the region's aquifers are experiencing overdraft conditions (DWR 1994).

Between 1985 and 1990, the average cost of surface water in this region is estimated at $15 to $45 per acre-foot, which is about the average in California. The cost of groundwater in the Bay Region is much higher ($60 to $130 per acre-foot) compared with the Delta and Sacramento River regions.

8.1.1.3 Sacramento River Region

Historical Perspective.

Rice was the most important crop in the Sacramento River Region, accounting for 30% of the total irrigated acres. Almost 90% of California rice crops were grown in this region during the 1946-1950 period. The next important crops in the Sacramento River Region were irrigated pasture and orchards, each accounting for 20% of the total irrigated acres.

Existing Conditions

Agricultural Land Use. Land uses in the Sacramento River Region are principally agricultural and open space, with urban development focused in the city of Sacramento. More than half the region's population lives in the greater metropolitan Sacramento area. Other fast-growing communities include Vacaville, Dixon, Redding, Chico, and various Sierra Nevada foothill towns. Urban development has occurred along major highway corridors in Placer, El Dorado, Yolo, Solano, and Sutter counties, and has taken some irrigated agricultural land out of production. Suburban ranchette homes on relatively large parcels surround many of the urban areas, and often include irrigated pastures or small orchards.

Excluding the legal Delta portion of the Sacramento River region, in 1994 there were approximately 2.2 million acres of important farmland mapped in the Sacramento River region (DWR 1994).

Agricultural Water Use. About 40% of irrigation water sources in the Sacramento River Region are from local water rights or local water projects. CVP project water and groundwater each makes up the rest of the total agricultural water uses. The 30% of the region's lands that are irrigated with groundwater generally have a very reliable supply.

The majority of diverters along the Sacramento and Feather Rivers existed before major CVP and SWP reservoirs were built. Between 1985 and 1990, the average cost of surface water in this region is estimated at $0 to $15 per acre-foot, among the lowest in California. The cost of groundwater is estimated at $30 to $60 per acre-foot, also among the lowest in the state.

8.1.1.4 San Joaquin River Region

Historical Perspective.

Between 1946 and 1950, in terms of irrigated acres, cotton and grains were the most important crops in the San Joaquin River Region, accounting for 22% and 20% of the total irrigated acres, respectively. The next important crops in the San Joaquin River Region were irrigated pasture, alfalfa and grapes, each accounting for about 15% of the total irrigated acres. Almost 100% of California cotton and 90% of California grapes were grown in this region during the 1964-1950 period.

Prior to the 1960s, land uses in the San Joaquin River Region were principally agriculture and open space, with urban uses limited to small farm communities. Although agriculture and food processing are still the region's major industries, expansion from the San Francisco Bay Area and

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Sacramento over the past 30 years has resulted in the creation of major urban centers throughout the region.

Existing Conditions

Agricultural Land Use. Land uses in the San Joaquin River Region are predominantly open space in the mountain and foothill areas, and agricultural in the San Joaquin Valley area. Urban land use in 1990 totaled 295,300 acres. Urban areas include the cities of Stockton, Modesto, Merced, and Tracy, as well as smaller communities such as Lodi, Galt, Madera, and Manteca. The western side of the region, south of Tracy, is sparsely populated. Small farming communities provide services for farms and ranches in the area, all relatively close to Interstate 5.

In 1994, excluding the legal Delta portion of San Joaquin County, about 4,750,000 acres of important farmland were mapped in the San Joaquin River Region.

Excluding the legal Delta portion of the ~~Sacramento River~~ region, in 1994 there were approximately 2.2 million acres of important farmland mapped in the Sacramento River region

Agricultural Water Use. About 40% of irrigation water sources in the San Joaquin River Region are from local water rights or local water projects. CVP project water provides 35% of total irrigation water uses, mostly to the Westlands Water District. The rest of the region's water is from the SWP and groundwater pumping.

Between 1985 and 1990, the average cost of surface water in this region is estimated at $20 to $85 per acre-foot, among the high end in California. The cost of groundwater is estimated at $30 to $80 per acre-foot, also among the high end in the state.

8.1.1.5 SWP and CVP Service Areas Outside the Central Valley

Historical Perspective.

Between 1946 and 1950, in terms of irrigated acres, alfalfa and subtropical orchards were the most important crops in the region, accounting for 24% and 22% of the total irrigated acres, respectively. The next important crops in the region were truck crops, field crops, and grains, each accounting for about 15 to 20% of the total irrigated acres. Other crops grown in the region included pasture and orchards. Over 90% of California subtropical orchards were grown in this region during the 1964 to 1950 period. Development in the region has steadily increased since the 1880s.

Existing Conditions

Agricultural Land Use. About 15% (377,500 acres) of the region's land is estimated to comprise agricultural land uses. Intensive agriculture is in the Santa Maria and lower Santa Ynez valleys; moderate levels of agricultural activity also occur near the South Coast area. Agricultural crops include grapes, vegetables, and truck crops, as well as a thriving flower seed industry. Total irrigated land in the area was about 145,000 acres in 1990.

The South Coast is the most urbanized region in all of California. Irrigated cropland accounts for about 288,000 acres of the region. The largest amount of irrigated agriculture is in Ventura County, where about 116,600 acres of cropland are cultivated, including vegetables, strawberries, citrus, and avocados.

Agricultural Water Use. Outside the Central Valley, SWP water and groundwater each provides 40% of total irrigation water in the region. Local water provides the rest of total irrigation water uses.

Between 1985 and 1990, the average cost of surface water in this region is estimated at $15 to $255 per acre-foot, among the highest in California. The cost of groundwater is estimated at $80 to $120 per acre-foot, also among the highest in the state.

8.1.2 *Affected Environment: Economic and Social Issues*

California agriculture produces an abundance of products including over 50% of the U.S. production of fruits, nuts, and vegetables on 3% of U. S. farmland. The economic value of agriculture to the communities of the Sacramento Valley, the Delta, and the San Joaquin Valley is greater than the gross value of the farm products (farm gate value) or the number of direct farm-related jobs. There are two ways in which the agricultural industry impacts local and regional economies. First, to produce and harvest a crop requires a variety of inputs such as seed, fertilizer and chemicals, water, equipment and fuel, and labor. Then, after harvest, farm produce is transported, stored, processed, packaged, and marketed. These result in direct economic activity. Second, is the distribution of the income resulting from the initial direct economic activity. This income supports local and regional economies as this farm and farm-related income is spent for food, housing, and other consumer items. Depending on the farm commodity produced, and the extent of value-added processing it receives, the economic multiplier effect can range from 1.8 to 4, with a general average of 2.7 often cited. According to California agricultural statistics for 1995, farm income totaled $22.1 billion and generated over $70 billion in related economic activity, resulting in an overall economic multiplier of 3.2.

A November, 1992 study by the University of California estimated that farming and farm-related industries in the Central Valley directly and indirectly create about three out of ten jobs and about 30% of personal income. Statewide, agriculture and related activities account for about one in every ten jobs.

8.1.2.1 All Regions

Existing Conditions

Farm Profiles. Numbers and sizes of farms, together with ownership patterns, describe the general structure of agriculture within a region. A large number of farms can mean larger economic influences within the region in terms of employment, spending, and taxes. Ownership patterns can give an indication of the numbers of farm owners and managers who live within a region. Labor expenses are important to workers and the communities in which they live.

Table 7 shows a summary of farm profiles by region.

Cropping Patterns and Production Value. A cropping pattern is the share of acres within a region planted to individual crops or categories of crops, including fallowed land. Agricultural land use can be partially described by its cropping pattern, and cropping patterns are important to agricultural and regional economics. If CALFED actions reduce the amount of irrigation water available, farmers can change their cropping patterns by fallowing a portion of the lands that receive Delta export water, by planting crops that require less irrigation water, or by adopting water conservation measures.

Agricultural Production Costs and Revenues. Agricultural net returns are revenues less costs. Higher costs reduce farm profits, but some part of costs also represent farm expenditures in the regional economy. Revenues are unit price multiplied by the level of production. ***Table 8.1.1-1*** includes regional summaries of production costs and revenues for example years 1987 and 1992.

Social Well-Being Related to Agriculture. To describe the affected environment for social well being, this document relies on the grouping of counties for each region shown as follows in ***Table 10***. This grouping is necessary in order to aggregate racial, income and population data from the U. S. Census.

The affected environment for social well being involves both community stability issues and environmental justice issues. Although community stability and environmental justice issues overlap in many respects (for example,

income and poverty levels) they are discussed separately for organizational purposes. Additionally, community stability is described for the entire study area rather than on a regional basis.

CALFED Regions	Counties
Delta Region	98% of Contra Costa, 45% of Sacramento, 46% of San Joaquin, 30% of Solano, and 20% of Yolo counties.
Bay Region	Alameda, 2% of Contra Costa, Marin, Napa, San Benito, San Francisco, San Mateo, Santa Clara, Santa Cruz and Sonoma.
Sacramento River Region	Butte, Colusa, Glenn, Placer, 55% of Sacramento, Shasta, 70% of Solano, Sutter, Tehama, 80% of Yolo, and Yuba.
San Joaquin River Region	Fresno, Kern, King, Madera, Merced, 54% of San Joaquin, Stanislaus, and Tulare.
SWP and CVP Service Area Outside Central Valley	Imperial, Los Angeles, Plumas, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, and Ventura.

Table 10. CALFED Regions and Groupings of Counties

Community Stability. The affected environment for community stability includes the following:

- Social groups in the CALFED study area,
- Economic indicators of social well being,
- Employment opportunities, and
- Community social structure.

Several important social groups are related to agriculture in the study area: farmers, farm workers, and agribusiness.

Economic indicators of social well being include population demographics, median family income, per capita income, poverty rates, and unemployment rates. These indicators are summarized by region in ***Table 8.1.1-2.***

This section summarizes regional economic indicators of social well being in the study area as they apply to all social groups and communities. Some general conclusions derived from review of the economic data presented in ***Table 11*** are as follows:

- In the study area, people living in predominantly rural areas have lower incomes, higher poverty rates, and higher unemployment rates than those living in the urban regions. However, San Francisco and Los Angeles counties experience high income levels and some of the highest poverty rates in the state.

- In all regions (except the Sacramento River Region) pockets of prosperity have an "averaging effect" of raising average personal income levels and lowering average poverty and unemployment rates, as shown in ***Table 11.***

Personal income is measured as family and/or per capita income, as shown in ***Table 11.*** Median family income is a measure of the annual income received by families living together in the same household. The median is a statistical term for the midpoint of a data set. There is a wide range of median family income in the study area. Per capita income in the study area ranges from $10,000 in the Tulare Lake area and Yuba County (Sacramento River Region) to $28,000 in Marin County in the Bay Region.

There is a wide range of poverty rates within the study area. The highest poverty rates in the study area occur in predominantly rural areas, and poverty rates are higher among minority ethnic groups. A 1986 study by the EDD (Ong et al. 1986) estimated the poverty rates among races in California during 1980, as summarized in ***Table 12.***

Ethnicity	Poverty Rate (Percentage)
White	6
Black	21
Hispanic	18
Asian and other	11

Table 12. Poverty Rate by Ethnicity

As shown in ***Table 11***, existing unemployment rates are lowest in the Bay and Delta regions where more employment opportunities are available. Unemployment rates are presented as a range in areas with diverse economies such as the urban and agricultural areas in the Sacramento Valley and San Joaquin Valley.

Unemployment rates in the study area are higher among minority ethnic groups. The EDD (Ong et al. 1986) estimated statewide unemployment rates among races in California during 1980, as summarized in ***Table 13.***

Ethnicity	Unemployment Rate (percentage)
White	4
Black	7
Hispanic	7
Asian and other	4

Table 13. Unemployment Rate by Ethnicity

Average annual agricultural employment was about 400,000 to 435,000 jobs from 1987 to 1992. Approximately 420,000 people were employed in the agriculture industry in 1992 (EDD 1993). The relationship between the agricultural sector and the larger economy of the Central Valley is important in assessment of social factors. Agricultural employment is becoming a less significant factor in measuring the viability of the local economy in all areas of the Central Valley than it once was historically. The economy of the Central Valley has grown and diversified, and non-agricultural employment opportunities are increasing. This general trend does not hold true for some communities. Agriculture remains the dominant industry and economic force in many smaller communities.

Factors affecting social well being include not only employment opportunities but also job guarantees. Job guarantees are affected by seasonal employment trends and economic trends and, in some cases, natural occurrences. Seasonal employment affects agricultural workers. Economic trends also may affect agriculture. Natural occurrences such as weather conditions can shorten or lengthen seasonal employment opportunities. For example, water shortages can reduce the number of acres farmed. Natural occurrences such as drought and flood conditions and economic conditions are not under the control of CALFED and, although they are not addressed further in this chapter, are important to consider in the assessment of existing conditions.

For the CALFED study area, the largest sectors of workers who may be affected are seasonal farm workers and agricultural workers. Seasonal unemployment among farm workers and agricultural workers usually occurs during winter months following harvest and summer vacation periods. Changes in seasonal employment can affect the demand for social services. The demand for social services increases during periods of unemployment, such as requests for unemployment payments, health services, and other family support programs. The need to utilize family, health, and income support services can decrease social well being among persons who are employed during much of the year but are seasonally unemployed.

Local communities provide a social base for people to access assistance and support during times of need. The social structure of a community may provide job training, educational opportunities, family support services, religious and cultural outlets for support and counseling, recreational opportunities, and monetary assistance. These services may be available through community or county agencies or from

cultural and religious institutions within the community. The local community also provides an identifying factor for all residents and a sense of belonging. When economic changes occur within an area, such as the loss or gain of a major employer or drought or flood conditions, the local community can be affected significantly.

This is especially true if the local economy is centered around one industry type, such as agriculture. The community is a crucial level of social organization. It is at this level that most social services are delivered, social networks formed, and values and beliefs confirmed.

Environmental Justice. The analysis of potential environmental justice issues focuses on the farm worker population. Within the population potentially affected by the CALFED program, this population is the most racially diverse. Table 14 indicates ethnicity by region, and Table 15 presents the racial distribution of farm workers by region.

The vast majority of U.S. farm workers have been Mexican immigrants and their children since the Bracero Program, which operated from 1942 to 1964 , brought in more than 4 million laborers from Mexico. Earlier decades saw substantial numbers of Chinese, Japanese, Filipinos, and Native and African Americans. By 1983, an estimated 90% of the seasonal farm laborers in California were Mexicans or Chicanos, while nationwide the figure was 60%. Most migrant farm workers are either American citizens or are working in the country legally. The Department of Labor estimates that about 25% of migrant farm workers are illegal immigrants.

Additionally, the Department of Labor estimates that at any given time, 12% (or at least 190,000) domestic farm workers are out of work nationwide. The majority of farm workers earn annual wages of less than $7,500. Although wage rates for farm workers have increased over the last decade, when they are adjusted for inflation, farm workers' real wages have decreased 15 to 25% in that time. (USDA 1991.)

8.1.2.3 Delta Region

Historical Perspective. Between 1944 and 1964, the number of farms in the region increased from 3,457 in 1944 to 4,502 in 1949, and then declined to 3,374 in 1964. The decline was due mainly to the accumulation of irrigated land into fewer and larger farms. As a result, the average farm size in the Delta Region increased from 58 acres in 1944 to 132 acres in 1964.

Existing Conditions

Farm Profiles. The number of farms decreased from 4,033 in 1987 to 3,639 in 1992 in the Delta Region, partly due to loss of farm land (62,000 acres) to industrial and urban uses, and partly to the accumulation of farm land into fewer and larger farms. The average farm size increased from 238 acres to 247 acres during this period. About 70% of farms in the Delta are operated by full owners.

Cropping Patterns and Production Value. Field crops dominate Delta crop production, accounting for 30% of the region's total harvested acres. The next important group of crops in the region include alfalfa, grains, and orchards, each accounting for ten to 15% of the total crop acreage. Orchards and grapes together accounted for less than 20% of the total harvest acreage in the Delta between 1986 and 1995, but produced about 50% of the total production value, reflecting high crop values per acre. Alfalfa and field crops produced about 15% of total production value, with more than 40% of total harvested acres, indicating lower crop values per acre.

Agricultural Production Costs and Revenues. Agricultural net returns are revenues less costs. Higher costs reduce farm profits, but some part of costs also represent farm expenditures in the regional economy. Revenues are unit price multiplied by the level of production.

Farms in the Delta Region achieved $496 million in agricultural sales in 1987 and $590 million in 1992, as shown in **Table 8.1.1-1**. Production expenses were about $474 million in 1992, leaving a net cash return of $126 million. Hired and contract labor was the largest expense reported, accounting for 25% of total expenses.

Social Well-being Related to Agriculture.

As shown in **Table 8.1.1-2**, the 1996 total population for the Delta Region was 2,362,514. The median family income was $40,690 (1989), per capita income was $21,991 (1994), poverty rate was 11 percent (1990), and the unemployment rate ranged from 5.8 to 12.3 percent (1995).

8.1.2.3 Bay Region

Historical Perspective. Between 1944 and 1964, the number of farms increased from 5,581 in 1944 to 6,146 in 1954 in the Bay Region, then declined to 4,103 in 1964. This was partly due to the accumulation of irrigated land into fewer and larger farms and urban encroachment.

Existing Conditions

Farm Profiles. The number of farms decreased from 8,377 in 1987 to 7,453 in 1992 in the Bay Region, partly due to loss of farm land (54,000 acres) to industrial and urban uses, and partly to the accumulation of farm land into fewer and larger farms. The average farm size increased from 276 acres to 303 acres during this period. About 70% of farms in the Bay Region are operated by full owners.

Cropping Patterns and Production Value. Grapes are the dominant crop in the Bay Region, accounting for 30% of the region's total harvested acres. The next important group of crops in the region is sugar beets and truck crops, each accounting for about 20% of the total crop acreage. Between 1986 and 1995, grapes and orchards together accounted for less than 50% of the total harvest acreage, but produced about 80% of the total production value, reflecting high crop values per acre. Alfalfa, grains, and field crops produced about 2% of total production value, with more than 35% of total harvested acres.

Agricultural Production Costs and Revenues. Farms in the Bay Region achieved $845 million in agricultural sales in 1987 and $1,065 million in 1992, as shown in Table 8.1.1-1. Production expenses were about $831 million in 1992, leaving a net cash return of $240 million. Hired and contract labor was the largest expense reported, accounting for about 40% of total expenses, and it has been increasing over time.

Social Well-being Related to Agriculture. As shown in **Table 8.1.1-2**, the 1996 total population for the Bay Region was 5,498,964. The median family income was $46,373 (1989), per capita income was $28,079 (1994), poverty rate was 9 percent (1990), and the unemployment rate ranged from 4.3 to 13.5 percent (1995).

8.1.2.4 Sacramento River Region

Historical Perspective. Between 1944 and 1964, the number of farms increased from 9,948 in 1944 to 11,538 in 1954 in the Sacramento River Region, then declined to 9,255 in 1964. This was mainly due to the accumulation of irrigated land into fewer and larger farms. As a result, the average farm size in the region increased from 64 acres in 1944 to 138 acres in 1964.

Existing Conditions

Farm Profiles. The number of farms decreased from 11,916 in 1987 to 11,507 in 1992 in the Sacramento River Region, primarily due to loss of farm land (193,000 acres) to industrial and urban uses. The average farm size remained about the same during this period. About 70% of farms are operated by full owners.

Cropping Patterns and Production Value. Rice is the number one crop in the Sacramento River Region, accounting for 26% of the region's total harvested acres. The next important group of crops in the region includes field crops (19%), orchards (15%), pasture (11%), and grains (10%). Between 1986 and 1995, orchards and tomatoes together accounted for less than 25% of the total harvest acreage in this region, but produced about

50% of the total production value, reflecting high crop values per acre. Pasture, alfalfa, grains, and field crops produced less than 20% of total production value, with more than 50% of total harvested acres, indicating lower crop values per acre.

Due to extensive re-use of water in the Central Valley, significant savings only occur from fallowing or through crop shifts. Decreased reliability constrains the conversion to high-value crops because of increased risk, particularly when groundwater is unavailable or of low quality. More lower-value but drought tolerant crops are planted instead.

Agricultural Production Costs and Revenues. Farms in the Sacramento River Region achieved $1,515 million in agricultural sales in 1987 and $1,349 million in 1992, as shown in **Table 8.1.1-1**. Production expenses were about $630 million in 1992, leaving a net cash return of $304 million. Hired and contract labor was the largest expense reported, accounting for about 25% of total expenses.

The region supports about 2,145,000 acres of irrigated agriculture. About 1,847,000 acres are irrigated on the valley floor; the surrounding mountain valleys within the region add about 298,000 irrigated acres (primarily pasture and alfalfa) to the region's total.

Social Well-being Related to Agriculture. As shown in **Table 8.1.1-2**, the 1996 total population for the Sacramento River Region was 1,666,650. The median family income was $31,794 (1989), per capita income was $18,313 (1994), poverty rate was 13 percent, and the unemployment rate ranged from 6.1 to 19.7 percent (1995).

8.1.1.4 San Joaquin River Region

Historical Perspective. Between 1944 and 1964, the number of farms increased from 30,212 in 1944 to 33,832 in 1949 in the San Joaquin River Region, then declined to 25,153 in 1964. This was mainly due to the accumulation of irrigated land into fewer and larger farms. As a result, the average farm size in the region increased from 78 acres in 1944 to 155 acres in 1964.

Existing Conditions

Farm Profiles. The number of farms in the San Joaquin River Region decreased from 28,742 in 1987 to 26,731 in 1992, partly due to loss of farm land (439,000 acres) to industrial and urban uses, and partly due to the accumulation of farm land into fewer and larger farms. The average farm size increased from 351 acres to 361 acres during this period. About 73% of farms are operated by full owners.

Cropping Patterns and Production Value. In terms of harvested acres, cotton is the number one crop in the San Joaquin River Region, accounting for 25% of the region's total harvested acres. The next important crops in the region are field crops (15%), orchards (13%), grapes (10%), and alfalfa (10%). Between 1986 and 1995, grapes and orchards together accounted for less than 25% of the total harvest acreage in this region but produced about 50% of the total production value. Pasture, alfalfa, grains, and field crops produced less than 20% of total production value with more than 50% of total harvested acres.

Agricultural Production Costs and Revenues. Farms in the San Joaquin River Region achieved $6,565 million in agricultural sales in 1987 and $8,089 million in 1992, as shown in **Table 8.1.1-1**. Production expenses were about $2,736 million in 1992, leaving a net cash return of $1,520 million. Hired and contract labor was the largest expense reported, accounting for about 25% of total expenses.

Social Well-being Related to Agriculture. As shown in **Table 8.1.1-2**, the 1996 total population for the San Joaquin Region was 3,004,222. The median family income was $30,862 (1989), per capita income was $16,475 (1994), poverty rate was 18 percent (1990), and the unemployment rate ranged from 8.1 to 16.9 percent (1995).

8.1.2. SWP and CVP Service Areas Outside the Central Valley

Historical Perspective. Between 1944 and 1964 in the SWP and CVP Service Areas Outside the Central Valley, the number of farms decreased from 33,715 in 1944 to 13,603 in 1964, mainly due to the accumulation of irrigated land into fewer and larger farms. As a result, the average farm size in the region increased from 30 acres in 1944 to 82 acres in 1964.

Existing Conditions

Farm Profiles. The number of farms in the region decreased from 21,281 in 1987 to 19,899 in 1992, primarily due to loss of farm land (791,000 acres) to industrial and urban uses. The average farm size decreased from 295 acres to 276 acres during this period. About 80% of farms in this region.

Cropping Patterns and Production Value. In terms of harvested acres, alfalfa is the number one crop in the region, accounting for 28% of the region's total harvested acres. The next important crops in the region are pasture (12%), subtropical orchards (11%), field crops (10%), and grains (10%). Between 1986 and 1995, truck crops and orchards together accounted for less than 30% of the total harvest acreage in this region but produced about 70% of the total production value. Pasture, alfalfa, grains, and field crops produced less than 15% of total production value with more than 50% of total harvested acres.

Agricultural Production Costs and Revenues. Farms in the SWP and CVP Service Areas Outside the Central Valley achieved $3,743 million in agricultural sales in 1987 and $4,295 million in 1992, as shown in **Table 8.1.1-1**. Production expenses were about $3,510 million in 1992, leaving a net cash return of $814 million. Hired and contract labor was the largest expense reported, accounting for about 30% of total expenses.

Moderate levels of irrigated agriculture subsist in the Mojave River, Antelope, and Indian Wells valleys. Most of the acreage produces alfalfa, pasture, or deciduous fruit. About one-half (30,000 acres) of the entire region's irrigated crop land is estimated to lie in the SWP and CVP Service Areas Outside the Central Valley.

Prominent agricultural crops in the southern portion of San Bernardino County, the middle portion of Riverside County, and the Salton Sea in Imperial County include alfalfa, winter vegetables, melons, grapes, dates, and wheat, located primarily in the Coachella Valley area.

Social Well-being Related to Agriculture. As shown in **Table 8.1.1-2**, the 1996 total population for the CVP and SWP Service Areas was 19,159,450. The median family income was $38,825 (1989), per capita income was $20,358 (1994), poverty rate was 13 percent, and the unemployment rate ranged from 5.1 to 28.8 percent (1995).

8.1.3 Environmental Consequences: Agricultural Land and Water Use

There is additional information related to land use in the next section "Economic and Social Issues." The information is noted there rather than here to help the reader better understand economic effects.

8.1.3.1 Assessment Methods

Agricultural land use impacts could occur in two main categories: direct and construction-related impacts; and indirect and operational impacts.

Direct impacts are those changes in physical land uses, or in land use designations, which result from construction of new facilities or conversion of lands from one use to another. For purposes of this analysis, direct impacts are those that would occur if any of alternatives, or combinations of alternatives, were implemented.

8.1.4 Environmental Consequences: Agricultural Land and Water Use

8.1.4.1 Assessment Methods

Agricultural land use impacts could occur in two main categories: direct and construction-related impacts; and indirect and operational impacts.

Direct impacts are those changes in physical land uses, or in land use designations, which result from construction of new facilities or conversion of lands from one use to another. For purposes of this analysis, direct impacts are those that would occur if any of alternatives, or combinations of alternatives, were implemented.

Indirect effects occur later in time and could be further removed in distance. Indirect land use effects would be changes in broad land use policies, resources, or economies which could result from changes in land uses, or in the long-term availability of water resources. Potential indirect and operational impacts of the program include long-term changes in the number of acres in agricultural use.

As a Programmatic EIS/EIR, this assessment does not provide site-specific details or specific estimates of acreages potentially affected for a given alternative. Rather, potential increases or decreases in agricultural and uses by region is qualitatively estimated, or described with a range of gross acres.

8.1.4.2 Significance Criteria

The following impacts would have potentially significant agricultural land or water use effects:

- Impacts upon any lands classified as prime and unique farmlands
- Conversion of agricultural lands or losses of croplands
- Inconsistency with agricultural objectives of local and regional plans
- Surface or Groundwater level changes that would impact agricultural lands

This section also addresses the land use significance criteria recommended in the *State CEQA Guidelines*.

- affect agricultural resources or operations (e.g., impacts to soils or farmlands, or impacts from incompatible land uses);
- conflict with applicable environmental plans or policies adopted by agencies with jurisdiction over the project; or
- conflict with general plan designations or zoning.

8.1.4.3 Comparison of No Action Alternative to Existing Conditions

The key changes between current conditions and No Action conditions involve converting agricultural land uses to accommodate facilities associated with reasonably foreseeable future actions. Additional agricultural impacts are anticipated from urbanization of agricultural lands as Central Valley towns and cities grown in population. Specific agricultural land use impacts (versus impacts to open space or municipal and industrial lands) would depend upon the actual location of the modifications and improvements to be implemented under the No Action Alternative.

Land Retirement: ***(insert brief discussion of projected acres of land to be retired in San Joaquin River region by 2020--No action)***

Ag. Water Use: brief discussion of effects of CVPIA Dedicated water for restoration-- insert table 2)

8.1.4.4 Comparison of Program Alternatives to No Action Alternatives

Delta Region

Potential land use changes attributable to each Alternative are noted in Chapter 5, in Sections 5.21, 5.22, 5.23 and 5.24. Further, potential effects on important farmlands are noted in Section 5.25.

Storage and Conveyance.
Alternatives 1, 2 and 3. Potential direct and significant adverse land use impacts of new or expanded surface storage would be, in general, converting existing land uses for these improvements. Specific land use impacts would depend on the exact location of the new storage facility. For purposes of this programmatic analysis, it is assumed that most new reservoir sites would be located in the foothills rather than in flat, valley-bottom areas where agriculture land uses would predominate. Therefore, storage components of would likely affect less productive agricultural lands, such as grazing lands, and not the better farmland generally found on the valley floor.

There would be substantial in-Delta water conveyance facilities in Alternatives 2 and 3.

Channel widening and island flooding in Alternative 2 will require purchasing and converting agricultural lands. Adverse land use impacts of the modifications would potentially be significant.

Creating an open channel isolated conveyance in Alternative 3 would be a significant adverse land use impact due to permanently converting underlying land uses from agriculture (primarily) to open space. Constructing a buried pipeline isolated conveyance, however, would be a short-term, temporary adverse impact on surrounding land uses. Any agricultural land uses affected could resume after completing pipeline construction.

Prime and unique farmland could be affected by the Alternative 1 configurations. Conversion of prime or unique farmland to other uses could also conflict with local or regional agricultural land use plans or policies, which could be a significant impact.

The specific locations of improvements contemplated for the alternatives have not been identified for this programmatic-level analysis. Thus, the consistency of project alternatives with general plan land use designations or zoning are not evaluated herein. However, inconsistency with these plans could result in a significant adverse land use impact.

Levee System Integrity Program. Levee System Integrity measures could affect up to 35,000 acres of land in the Delta, most of which would likely be agricultural land. However, the specific locations of lands that would be affected by the Program are not known at this time. The impacts from this program would primarily affect agricultural land uses in the Delta Region and would not directly affect land uses in the other four regions.

Water Transfer Program. The Water Transfer Program would affect land use economics primarily through changes to agricultural, open space, habitat, and developed land use. However, the Water Transfer Program is not expected to affect open space or developed land use because the augmented water supply is assumed to replace existing water supplies. In addition to the source of water for a transfer, the timing, magnitude, and pathway of each transfer have a tremendous effect on the potential for significant impacts. The water source varies according to the water transfer category: crop fallowing (surface water or groundwater), shifting to a crop with a lower water demand (surface water or groundwater), groundwater substitution for surface water (surface water), direct groundwater transfers (groundwater), conserved water (surface water or groundwater), and stored water in reservoirs (surface water).

Potential significant beneficial impacts are associated with the transferred water's destination, and include: 1) increasing agricultural acreage in areas with limited water supplies; and

2) increasing habitat acreage in areas with limited water supplies.

Potential significant adverse impacts are associated with the transferred water's origin, and include: 1) decreasing agricultural acreage due to crop fallowing; 2) decreasing agricultural acreage due to increased costs resulting from direct groundwater or groundwater replacement transfers; 3) causing land use changes that could be inconsistent with local agricultural objectives; and 4) decreasing habitat acreage.

Water transfers are not expected to have direct land use impacts, however, they could indirectly affect agricultural opportunities by changing availability in selling and receiving areas.

Ecosystem Restoration Program. The ecosystem restoration program recommends conversion of land in the Delta Region to habitat and ecosystem restoration, levee setbacks, and floodways. In general, agriculture is the dominant land use on the non-conveyance side of levee structures in the Delta. Given these general land use patterns, it can be ~~expected that existing agricultural uses~~ will potentially be affected by ecosystem restoration program improvements. Some of these agricultural uses likely will be shifted to the Central Valley or ~~elsewhere~~. ***The mix of crops taken out of production and converted to habitat is not known because the specific locations where willing seller land acquisitions and restoration will occur are unknown. Consequently, estimating the reduction in applied water is somewhat speculative. However, using a hypothetical example, and assuming a rough average of 3 acre-feet of applied water per acre of land in production and that the maximum potential footprint of 115, 000 acres were converted to habitat in the Delta, about 345,000 acre-feet of applied water would be left in the stream or used for environmental purposes. It is important to note that applied water does not equal water potentially available for other beneficial users. Much of the water applied to Delta lands returns as flow to the rivers in the Delta. In addition, flora that is restored in the Delta will consume much of the water that would have been used by crops.***

Water Quality Program. The long-term benefits of this program include reduced production costs, higher crop yields, and greater crop selection flexibility. Potentially significant impacts resulting from implementation of this program include reduced agricultural productivity due to changes in agricultural practices and increased production costs associated with program implementation, and any changes in the quantity or pattern of stream flow, which could affect downstream agricultural water users.

Water Use Efficiency Program. The water use efficiency program is not anticipated to have direct land use impacts, however, there may be indirect impacts to agricultural land use. Agricultural land may be removed from production because of increased costs and decreased profitability which could result from required efficiency improvements or increased district water charges (for example, as part of tiered water pricing). Conversely, improved efficiency may allow the continued viability of agriculture in some areas. Efficiency improvements that result in greater water supply reliability but also higher annual cost may cause a shift in the types of crops grown. Conversion or loss of agricultural land would be a potentially significant adverse land use impact of this program. Improvement in the long-term viability of some agricultural lands would be a potential beneficial impact.

Bay Region

Alternatives 1, 2, and 3. The compatibility and consistency of potential actions with these plans is not evaluated in this programmatic-level analysis. However, inconsistency between applicable Alternative 1 program elements with existing area city and county land use plans could result in a significant adverse land use impact.

Potential land use impacts to agricultural land in the Bay Region are anticipated to be minimal and have not been quantified. *(Is this still true??)*

Sacramento and San Joaquin River Region

Storage and Conveyance.
Alternatives 1, 2, and 3. Storage facilities could result in converting agricultural land uses in the foothill or mountain areas, a potentially significant adverse impact. Development of storage facilities could also conflict with local and regional plans regarding agricultural lands.

The compatibility and consistency of potential actions with county and city local general land use plans are not evaluated in this programmatic-level analysis. However, inconsistency between applicable Alternative 1 program elements with these plans could result in a significant adverse land use impact.

Prime and unique farmland could be affected by the program storage elements. ***But because storage facility locations have not been chosen, the amount of important farmland affected is not known and will be determined in project-specific environmental documentation.***

Ecosystem Restoration Program. The ecosystem restoration program could convert agricultural land, primarily on the east side of the valley and the valley trough in the Sacramento Valley and lands east of the San Joaquin River in the San Joaquin Region.

Water Quality Program. ***Retirement or idling of agricultural land with water quality/drainage problems in the San Joaquin River region has been considered for inclusion in the Water Quality Program. However, at this time, neither the number of acres nor the specific locations of proposed land conversion or idling have been defined. The Water Quality Technical Team and stakeholders will continue to discuss the water quality, economic, and environmental benefits and costs of implementing an agricultural land idling program to improve water quality.***

Watershed Management Coordination. Potential watershed activities in the Sacramento River and San Joaquin River regions will be compatible with applicable agricultural land use plans and policies in their affected jurisdiction. Reduced grazing activities in the watershed could have potentially significant land use impacts in this region if they result in a loss of agricultural productivity.

Water Transfers. Potential water transfer program impacts would be similar to those discussed under the Delta Region.

SWP and CVP Service Area Outside the Central Valley.

Alternatives 1, 2, and 3. The compatibility and consistency of potential actions with county and city general local land use plans are not evaluated in this programmatic-level analysis. However, inconsistency between alternatives and these plans could result in a significant adverse land use impact.

Potential land use impacts to agricultural land in SWP and CVP Service Areas outside the Central Valley are anticipated to be minimal and have not been quantified.

Water Use Efficiency Program. Indirect changes in land use may result from the water use efficiency program. In some instances, agricultural land may be removed from production because of increased costs and decreased profitability which could result from required efficiency improvements or increased district water charges (for example, as part of tiered water pricing). Conversely, improved efficiency may allow the continued viability of agriculture in some areas. This will tend to maintain the existing uses of agricultural lands in some regions and reduce the amount that may go out of production or become urbanized. Efficiency improvements that result in greater water supply reliability but also higher annual cost may cause a shift in the types of crops grown. Conversion or loss of agricultural land would be a potentially significant adverse land use impact of the program. Improvement in the long-

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term viability of some agricultural lands would be a potential beneficial impact.

8.1.4.4 Comparison of Program Elements to Existing Conditions

The primary actions that differentiate existing conditions and No Action conditions are the CVPIA and Bay-Delta Accord. These actions are currently being implemented, therefore, the magnitude and intensity of impacts would be similar if existing conditions were the baseline for assessment. ***(This needs to be updated)***

8.1.4.5 Land Use Mitigation Strategies

As discussed in the introduction to this summary, mitigations are proposed as strategies in this programmatic document and are conceptual in nature. Final mitigations would need to be approved by responsible agencies as specific projects are approved by subsequent environmental review.

Avoidance or minimization strategies:

- Site and align Program features to avoid or minimize impacts on agriculture;
- Examine structural and non-structural alternatives to achieving project goals without impacting agricultural lands;
- Implement features that are consistent with local and regional land use plans;
- Work with local and regional jurisdictions to amend local plans and policies to bring Program features into compliance;
- Involve all affected parties, especially landowners and local communities in developing appropriate configurations to achieve the optimal balance between resource impacts and benefits.

Some examples of Ecosystem Restoration Program avoidance or minimization measures are:

- Habitat restoration efforts will first focus on developing new habitat on public lands;
- Absent public lands, restoration efforts will occur on lands acquired from willing sellers where at least part of the reason to sell is an economic hardship, i.e., land that floods frequently or the levees are too expensive to maintain;
- Where land is needed for waterside habitat, acquisition efforts will seek out points of land on islands where the ratio of levee miles to acres farmed is high;
- Obtain easements on existing agricultural land which would allow for minor changes in agricultural practices thus increasing the value of the agricultural crop(s) to wildlife;
- Floodplain restoration efforts would include provisions for continued agricultural practices;
- Water acquired for habitat purposes could be purchased using temporary or rotating contracts so that the same land or locality is not impacted every year; and
- Use a planned or phased habitat development approach in concert with adaptive management.

Some examples from the Levee System Integrity Program include:

- In implementing levee reconstruction measures, work with landowners to establish levee reconstruction methods which avoid or minimize the taking of agricultural land; and
- When planning subsidence control measures, work with landowners to establish Best Management Practices (BMPs) which avoid or minimize changing land use practices while protecting levees from the effects of subsidence. Through adaptive management, modify BMPs to further reduce impacts to agricultural land;

- Protection of other agricultural land of equivalent productive potential for agricultural use without restrictions. This could be accomplished via easements.

- Implementation of erosion control measures to the extent possible during and after project construction activities. These erosion control measures can include grading the site to avoid acceleration and concentration of overland flows, using silt fences or hay bales to trap sediment, and revegetating areas with native riparian plants and wet meadow grasses;

- Protect exposed soils with mulches, geotextiles, and vegetative ground covers to the extent possible during and after project construction activities to minimize soil loss;

- Schedule construction activities in a manner to that current crops may be harvested prior to construction initiation; and

- Develop agricultural infrastructure, buffers and other tangible support for remaining agricultural lands. These buffers should have vegetation compatible with farming and habitat objectives.

8.1.4.6 Potentially Significant Unavoidable Impacts

Program actions associated with the ecosystem restoration program, levee system integrity program, or storage and conveyance components could convert existing agricultural uses, including prime and unique farmland. Locally implemented water transfers could also convert existing agricultural land uses to other land uses, though not specifically CALFED Program uses.

~~transfer of water rights~~

Steve • water pricing mechanisms

Steve • longer contract periods

" • increased supply & supply reliab.

" • replacement of ~~ed~~ redirected ag water supply

8.1.5 Environmental Consequences: Agricultural Economic and Social Issues

8.1.5.1 Assessment Methods

Assessment variables for agricultural economic impacts are irrigated acres, agricultural water and land use, water quality, costs and revenues from agricultural production, and risk and uncertainty. Potential impacts are quantified based on existing estimates of land and water value, crop revenue per acre, and costs. Each configuration (e.g., 1A, 1B) is evaluated as part of an alternative. All of the potential impacts described are based on review of and experience with other studies.

Estimates of water supply changes, land conversion, and costs are made using existing policy-level models, such as the Central Valley Production Model, and by interpolating or extrapolating estimates made in other studies.

Changes in water quality are modeled for a number of scenarios that correspond to various CALFED alternatives. Key measurement points in the Delta are used to indicate the TDS of water diverted for irrigation. TDS (measured in ppm) is converted into electrical conductivity (EC) measured as millimhos per centimeter, using the approximation that 1 mmho/cm equals about 640 ppm.

Potential impacts on crop yield are based on the standard Maas-Hoffman (MH) salinity threshold relationships. For a given crop, the MH relationship defines the soil water salinity at which crop yield begins to be affected, and shows the estimated rate at which yield declines as soil salinity increases beyond the threshold. **Table 8.1.3-1** shows the threshold and rate of decline due to salinity for major categories of crops grown in the Delta.

8.1.5.2 Significance Criteria

Criteria used to judge whether an impact is potentially significant to agricultural resources are described below. Significance criteria are applied only to adverse impacts.

- **Irrigated Acres:** Permanent or long-term reduction in acres ~~exceeding five percent~~ of irrigated land within a region would be considered significant. Changes less than this are easily within historical variations due to weather and farm programs.

- **Agricultural Water Use:** Any increase in groundwater pumping that would cause or exacerbate overdraft of a basin would be considered significant. A change in surface water use could be significant if it leads to changes in land use or higher regional unemployment.

- **Agricultural Land Use:** Permanent or long-term reduction in agricultural acreage ~~exceeding 5%~~ of irrigated land within a region or the conversion of any lands categorized as prime or unique farmlands would be considered significant.

- **Water Quality:** Impacts of water quality changes on agriculture may be caused by changes in the salinity of water used for irrigation, measured as TDS. Potential impacts could arise because of reduced yields of salt-sensitive crops, additional water application and management costs due to salinity, or foregone revenue due to restricted crop selection. Several components of the CALFED program could affect the TDS of water delivered for agricultural use, including flows associated with the ERP, storage and conveyance components, and BMPs or other components of the Water Quality Program. A change in water quality that would reduce crop yields by 10% is considered significant.

- **Production Costs and Revenues:** Changes in costs and revenues would not, in themselves, be considered significant environmental

project by project & in context of cumulative impacts of the program esp a Whole
eg. Delta - 520,000ac
No! = 26,000ac
even 1% - 5,200 is significant.
- any diminishment in ag water supply, supply reliab., or water rights priority; quality, cropping flex. or yield
No. - all above

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Crop Category	Irrigated Acres (1,000 acres)	Threshold Salinity Level (Ece)	Percent Yield Decrease From the Threshold (%)
Pasture	37	5.0	10.0%
Rice	11	3.0	12.0%
Truck Crops	28	1.5	14.0%
Tomatoes	45	2.5	9.9%
Alfalfa	65	2.0	7.3%
Sugar Beets	15	7.0	5.9%
Field Crops	151	1.7	15.0%
Orchards	61	1.5	12.0%
Grains	60	6.0	7.1%
Grapes	36	1.5	19.0%

NOTE:
The salinity of the soil saturation extract is expressed as Ece which is the electrical conductivity (in mmho/cm).
SOURCES:
1. Irrigated acreage is from Affected Environment and Environmental Impacts: Agricultural Production and Economics, CALFED Bay-Delta Program, September 1997.
2. Maas-Hoffman coefficients are described in United Nations, Food and Agriculture Organization Irrigation and Drainage Paper 29, "Water Quality For Agriculture," 1976.

Table 8.1.3-1. Major Crops in the Delta Region and Corresponding Maas-Hoffman Coefficients.

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impacts. However, changes in costs or revenues could change the economics of farming to an extent that land use, water use, and employment could be affected.

- **Risk and Uncertainty**: No objective or numerical thresholds have been identified for judging the significance of changes in risk or uncertainty of agricultural production. Adverse impacts may be judged potentially significant if they have the potential for affecting agricultural land use and water use decisions.

8.1.5.3 Comparison of No Action Alternative to Existing Conditions

The predominant changes between existing conditions and the No Action conditions that would affect agricultural economics are: changes in the markets for agricultural products, the supply and reliability of irrigation water, changes in water quality, development of water transfer markets, and the cost of water.

- **Changes in the Agricultural Market**: There will be an increasing demand for fruits and vegetables, resulting in a shift away from field crops and grain production.

- **Irrigation Water Supply**: Several important changes have occurred to water supply conditions for agriculture. The CVPIA reallocates up to 800,000 AF of CVP water per year away from agricultural use for environmental restoration. Likewise, the 1994 Bay-Delta Accord reduces the amount of water pumped from the Delta and delivered for agricultural and municipal uses. Table

- **Water Quality**: Reasonably foreseeable changes in water management are expected to affect water quality, thereby impact agricultural yields. As shown in **Table 8.1.3-2**, the expected TDS range is between 109 ppm to 389 ppm or between an EC or 0.17 to 0.61 mmho/cm.

- **Water Transfers**: The use of water transfers will likely increase in the future, however, they have not been assessed in this report due to the uncertainty and speculation involved.

- **Cost of Water**: Implementing cost-of-service and tiered water pricing, plus the restoration charges and surcharges imposed by the CVPIA, will increase the cost of water by up to 100% in some CVP service areas. Also, districts looking for water to transfer are almost certain to spend more for that water than they have in the past.

- **CVPIA Land Retirement**: *(insert brief discussion of projected acres of land retired in San Joaquin River region from the CVPIA program; insert table 2)*

8.1.5.4 Comparison of Program Alternatives to No Action Alternative

Delta Region

Storage and Conveyance

Table 8.1.3-2

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Storage and Conveyance

Due to minimal in-Delta conveyance facility changes, conveyance capacity in Alternative 1 will continue to be the principle limiting factor to water transfers. The number and magnitude of water transfers will continue to be relatively small, except in critically dry years. The Water Transfer Program will influence only a fraction of Central Valley and Delta flows, generally increasing base flows but not exacerbating high flows. Alternatives 2 and 3 provide increasingly better water transfer opportunities than Alternative 1.

Alternative 1 conveyance configurations would affect up to 400 acres of agricultural land. The economic impact would be negligible.

The major difference between Alternatives 1 and 2 is in the conveyance components. For all Alternative 2 configurations, conveyance options would require land conversion of agricultural land, producing crop revenues of between $1.9 and $6.2 million per year. Loss of this revenue would be a substantial adverse economic impact.

The major difference between Alternatives 1 and 2 and Alternative 3 is in the in-Delta storage and conveyance components. Conveyance and storage options would require agricultural land conversion producing crop revenue of between $2.3 and $21 million per year. In-Delta storage would have potential negligible to minor beneficial effects on agricultural production in other parts of the Delta Region, by providing more reliability in flows and deliveries. Impacts to farm employment, agricultural suppliers, and other economic sectors are described in the next section. Impacts of water supply increases within the Delta Region would be small.

Potential charges imposed on agricultural water use to recover costs of program components could lead to significant changes in agricultural activities (e.g., land use, crop selection, water use).

.In the middle Delta, irrigation water quality under all alternatives averages between 121 and 240 ppm, which converts to an EC range of 0.22 to 0.37 mmho/cm (**Table 8.1.5-2**). The average EC during the months of highest salinity ranges from 0.21 to 0.42. Assuming an effective leaching fraction of 15%, the soil salinity would be 1.5 x 0.42 = 0.63 under the worst case of Alternative 3D. The most sensitive vegetable crops begin to experience salinity effects at 1.0 EC. Therefore, no significant positive or negative impact is expected from water quality changes in the middle Delta.

TDS in the south Delta is substantially higher than in the middle Delta. As shown for the Old River at Middle River location in Table 8.1.3-2, average water quality ranges from 318 to 378 ppm, depending on the alternative. This converts to a soil salinity of 0.75 to 0.88, assuming an effective leaching of 15%. During months of the poorest water quality, salinity of applied water can be 450 ppm. This level of salinity approaches the yield threshold for several salt sensitive truck crops, including beans and strawberries, and some care in water management is required to avoid yield losses. However, none of the alternatives show any significant change in salinity compared to the No Action Alternative, therefore no significant positive or negative impacts are apparent.

Ecosystem Restoration Program. Direct impacts of the ecosystem restoration program would be most felt in the Delta region. Agricultural acres would be taken out of production. The mix of crops removed could range from a mix of field and forage crops (corn, grain, and pasture) to high-valued orchards. The agricultural land would be purchased at a negotiated fair market value to reduce economic hardship on local farmers. These inputs would result in a gross revenue loss of from to $50 to $135 million per year. Some of this acreage and revenue would likely shift to other regions of the state, placing more demand on existing surface water and groundwater resources in those regions.

Control of upstream drain water quality and quantity from implementing the water quality component could reduce salinity of water diverted in the Delta for irrigation. Benefits could include

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reduced costs, higher yields, and more flexible crop selection. Water quality BMPs, if applied to Delta agriculture, could raise production costs.

Levee System Integrity Program. The levee system integrity program would benefit Delta agriculture by providing greater protection from inundation and salinity intrusion. Setback levees would require purchasing and converting agricultural land. The value of crops out of production could be between $6 and $13 million per year. This loss may be offset by lower flood risks to remaining agricultural lands.

Additionally, the loss of farmland may adversely affect the financial viability of local agencies, especially water and reclamation districts.

Bay Region

Storage and Conveyance. Up to 3,500 AF of irrigation water per year could be available from the Storage and Conveyance components, although the cost may remain high.

Potential charges imposed on agricultural water use to recover costs of program components could lead to significant changes in agricultural activities (e.g., crop selection, water use).

No Bay? Shallow water habitat agr.?

Ecosystem Restoration Program. Impacts ~~for Configurations 1A and 1B~~ from the ecosystem restoration program on agriculture are expected to be minor and similar to No Action conditions. To the extent that they apply to areas non-tributary to the Delta, BMPs under the water quality and water use efficiency programs could substantially increase production costs.

Water Transfer Program. Because of water supply deficiencies in some agricultural areas, especially the San Felipe Division of the CVP, water transfers may be an important source of water in the future.

Sacramento River and San Joaquin River Regions

Storage and Conveyance. Agricultural lands in the Sacramento Region and the San Joaquin River Region could be affected by the location of storage and conveyance facilities. The likely location of large storage facilities is in foothill or mountain areas, where land use is likely to be non-irrigated grazing. Impacts include permanent conversion and inundation and temporary disruption of agricultural activity during construction. Permanent conversion of farmland for facilities is a potentially significant impact. Impacts from improvements in water supply reliability are small in the Sacramento River Region.

Additional water supply could range from 10,000 to 35,000 AF/year in the Sacramento River Region and from 48,000 to 167,000 AF/year in the San Joaquin River Region. Configurations 3B and 3E, 3H, and 3I would provide much larger increases in supply during critical years, improving the overall reliability of irrigation water availability in both regions. This would be a beneficial impact, allowing production to continue when it would be reduced under No Action. **[Do we have #'s? Are they different than the 10k to 35k for Sac and 48k to 167k for SJ? If not, delete this section too.]**

Potential beneficiaries in the Sacramento River Region would be primarily CVP contractors, who would use the water to replace groundwater or supply lost from the CVPIA. According to an analysis completed for CVPIA, the direct value of this water to agriculture ranges from $30 to $40 per acre-foot, making it relatively costly. Much of the additional water in the San Joaquin River Region would be used to reduce groundwater overdraft, to increase instead flows, to support production of lands fallowed by supply restrictions of the CVPIA and Bay Delta Accord, and for agricultural production. The marginal value of this water for agricultural production is $60 to $100 per AF. Some of this water could support acreage shifted out of the Delta Region due to land conversion.

Potential charges imposed on agricultural water use to recover costs of program components could lead to significant changes in agricultural activities (e.g., crop selection, water use).

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Ecosystem Restoration Program. The ecosystem restoration program would convert productive farmland in the Sacramento River Region and the San Joaquin River Region to habitat, or for taking the land out of production to support instream flow water purchases. The crop revenue loss associated with these lands generally ranges from $500 to $1000 per acre, resulting in a regional loss in crop revenue of between $13 and $34 million per year in the Sacramento River Region and between $25 and $50 million in the San Joaquin River Region. This would have a substantial adverse economic impact on farm revenues, income generation, and employment levels. Loss of production may also adversely affect the financial viability of local agencies, especially water and reclamation districts.

Any changes in water supply, such as purchase of water rights for in-stream flow, could result in changes to cropping patterns, potentially affecting corp value. Direct impacts to the landowner would not be significant because the transaction would be only with willing sellers. Changes in the quantity or pattern on in-stream flow could affect downstream agricultural users, and could potentially be significant.

Water Quality and Water Use Efficiency Programs. BMPs for the water quality and water use efficiency programs could lead to significant impacts (both beneficial and adverse) in land and water use patterns. Adverse impacts would more likely result from costs imposed. Beneficial effects include reduced salinity of irrigation, which could increase yields, reduce production costs, and provide more flexible crop selection.

More carefully monitored application of water can result in substantially increased yields and reduced chemical costs, irrespective of salinity. Lower applied water amounts can adversely affect drain water users (forcing them to search for another source of supply), raise groundwater pumping lifts and impair groundwater storage for conjunctive use.

Watershed Management Coordination. Implementation of upper watershed enhancements could result in converting upper watershed agricultural lands located adjacent to waterways in order to restore riparian habitat, stabilize stream-channels, restore natural stream hydrology, and create a non-point source pollution buffer. Conversion of land use could have an adverse impact on net income and public finances, and result in foregone economic opportunities.

Water Use Efficiency Program. The economic impact of the water use efficiency program is uncertain, and could range from little or no measurable effect to potentially substantial reductions in applied water. Based on preliminary estimates prepared for the CALFED program, costs of achieving efficiency increases could range from $40 to $60 per AF of reduced applied water in the Sacramento River Region and from $50 to $100 per AF in the San Joaquin River Region. In the San Joaquin River Region, approximately $500 per AF of net savings could be realized; however, because virtually all applied water losses are recoverable and reusable in the Sacramento River Region, no net savings in consumptive use or irrecoverable loss (i.e., "real" water savings) are likely. Additional district-level costs could range from $5 to $12 per acre of land served in both regions.

Water Transfer Program. The Water Transfer Program would generally have the same beneficial and adverse impacts as identified for the Delta region. However, another potential significant beneficial impact of reduced pumping costs due to receiving a water transfer could occur. Similarly, other potential significant adverse impacts could occur. Water transfers due to direct groundwater pumping or groundwater substitution could cause a temporal or volumetric increase in groundwater pumping and increased costs associated with exacerbating groundwater overdraft; pumping from lowered groundwater levels; deepening wells; lowering pumps; and redrilling wells. These increased operating costs could reduce irrigated acreage at nearby farms that are not transferring water. Direct groundwater and groundwater substitution transfers could also cause a reduction in surface water flows due to induced seepage; reduce crop yields due to lower water quality; reduce demand

for crop storage and processing; reduce demand for farm inputs; lower ground elevations, making affected areas more susceptible to flooding; and reduce habitat supported by surface seepage of groundwater.

too detailed

Salinity of water diverted from the Delta for use in the San Joaquin Valley is estimated using the Tracy Pumping Plant Intake as the measurement location. As seen in **Table 8.1.3-2**, average salinity ranges from 278 ppm in the No Action Alternative to a low of 127 ppm in Alternative 3D. The highest salinity months range from 366 ppm to No Action down to 177 ppm in Alternative 3D. Soil salinity associated with these average values would range from 0.30 to 0.65. The highest salinity is estimated in the No Action Alternative, and the lowest in Alternative 3. Some areas receiving water from the Delta also have poor drainage, and some areas apply a mixture of groundwater and surface water. Therefore, the improvements to water quality, especially in Alternative 3, are potentially large enough to have some effect on crop selection, water management, and yields, and could provide a potentially significant benefit.

These estimates account for water quality changes due to water supply, conveyance, and operations changes. Impacts associated with the Water Quality Program and the Water Use Efficiency Program could potentially affect agricultural users, but the size and direction of these impacts in unclear. No estimates of changes in water quality for irrigation have been made for the Sacramento River Region.

Other SWP and CVP Service Areas Outside the Central Valley

Impacts on agriculture in this region are expected to be small. Potential cost impacts from the water quality and water use efficiency programs may occur if BMPs are applied to areas outside the Central Valley. Salinity intrusion benefits of the levee system integrity program would also be felt in this region.

Substantial conversion of agricultural land in the Delta Region could shift some production to desert areas in Southern California, such as the Imperial Valley. Additional water would be available to SWP contractors in the South Coast and Central Coast areas. However, it is unlikely that a significant amount of this water would be delivered for irrigation use.

SWP water delivered for irrigation in Southern California would have the same quality changes as described for the San Joaquin River Region. Relatively little SWP water pumped into Southern California is used for irrigation, and some of that gets mixed with other local water sources. The aggregate impact on agriculture in these areas is potentially beneficial but probably not significant.

Potential charges imposed on agricultural water use to recover costs of program components could lead to significant changes in agricultural activities (e.g., crop selection, water use).

The Water Transfer Program benefits are related to the increased agricultural production, incomes, and employment opportunities associated with any transfer that uses the water for agricultural production outside of the Central Valley.

8.1.5.5 Comparison of Program Elements to Existing Conditions

The primary actions that differentiate existing conditions and No Action conditions are the CVPIA and Bay-Delta Accord. These actions are currently being implemented and results forecasted. Therefore, the conclusions regarding the magnitude and significance of impacts would be the same if they are compared to existing conditions as compared to the No Action Alternative. ***(Is this still accurate?)***

8.1.5.6 Mitigation Strategies

As discussed in the introduction to this summary, mitigations are proposed as strategies in this programmatic document and are conceptual in nature. Final mitigations would need to be approved by responsible agencies as specific

projects are approved by subsequent environmental review.

Strategies to minimize economic consequences include:

- Advice on how to stretch existing water supplies in cost-effective ways to keep water acquisition costs down;
- Advice on ways to increase the production yielded from a unit of water (through things like improvement in distribution uniformity) which will tend to keep production up even as acreage goes down;
- Cost-sharing and other financial assistance to reduce the indirect impacts potentially resulting from the cost of water use efficiency and water quality programs;
- Purchase water acquired for habitat purposes using temporary or rotating contracts so that the same land or locality is not impacted every year;
- Continue the flow of property tax revenues to the local counties, providing opportunities for alternative industries to develop (i.e. recreation) and other economic incentives;
- Implement financial incentives to increase wildlife forage on agricultural lands (pay for inefficient harvest methods). Reduce unit charges for water when a farmer implements measures to control discharge of contaminants in excess of regulatory requirements;
- Alter water delivery schedules during shortages to reward farmers who implement measures to control discharge of contaminants in excess of regulatory requirements;
- Create a loan program to support construction of agricultural pollution control facilities;
- Provide technical assistance to farmers wishing to install pollution control facilities;
- Provide technical and financial assistance to develop a regional solution to the San Joaquin Valley drainage problem;
- Schedule construction activities in a manner so that current crops may be harvested prior to construction initiation;
- Pay fair market value for any crops destroyed or taken out of production on private or leased lands as a result of project construction;
- Compensate property owners for the value of their land and associated improvements, including dwelling units, in compliance with state regulations for providing relocation assistance to displaced persons or businesses, and
- Avoid fallowing or shifting crops that require high input and output expenditures.

8.1.5.7 Potentially Significant Unavoidable Impacts

Unavoidable impacts to agricultural economics that have the greatest potential to be significant are loss of prime farmland to other uses, such as for habitat or levee setbacks. These impacts would be both direct, such as loss of farm revenue and production opportunities, and indirect, such as less labor demand and reduced farm spending for goods and services.

8.1.6 Environmental Consequences: Agricultural Resources: Social Issues

8.1.6.1 Assessment Methods

Social well-being, for purposes of this analysis, is measured in terms of community stability. Community stability is a measure of a communities' ability to absorb social and economic changes that may result from a

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proposed action such as the CALFED action. Assessment of community stability is based on changes in economic and social indicators that may occur as a result of a CALFED action. These indicators include median family income, per capita income, poverty rates and unemployment rates, as summarized by region in **Table 8.1.1-2.** Chapter 8.11 provides a detailed region by region discussion of related Environmental Justice issues.

Predicting the human behavior that could result from CALFED actions is a difficult task. Past studies of community stability and social conditions related to water supply projects have focused on social, economic, and land use changes resulting from short-term drought conditions. The actual effects of implementation of long-term water supply programs cannot be predicted with complete assurance, but must be projected based on assumptions of human behavior, primarily the assumed actions of farm managers and land owners implementing long-term changes to farm operations. This analysis is based on the regional economics analysis and projected changes to regional employment. These findings have been applied to the analysis for farmers, farm workers, and agribusiness.

8.1.6.2 Significance Criteria

For purposes of this analysis, socioeconomic effects are measured in terms of community stability. Community stability is measured by several economic indicators. Economic indicators include median and per capita income, poverty rates, and unemployment. Adverse impacts to community stability could result from changes to any of these indicators that substantially exceed historical fluctuations.

8.1.6.3 Comparison of No Action Alternative to Existing Conditions

All Regions. The key factors that would affect farmers under the No Action Alternative include changes in the markets for agricultural products; the supply and reliability of irrigation water; the development of water transfer markets; and the cost of water. Increasing demand for fruits and vegetables is expected to result in a shift toward production of these commodities, and away from field crops and grains. Decreases in water availability due to the Central Valley Project Improvement Act (CVPIA) and the Bay-Delta Accord would likely be made up with groundwater supplies, however, depending on the size of the deficit, groundwater may not be able to completely compensate.

The number of agricultural jobs may increase in areas due to projected changes in crop production to higher value and more labor intensive crops. However, agricultural employment would remain seasonal. There could be improvements in mechanization for picking and sorting crops and other improvements that could eliminate tasks that are currently labor intensive. Changes in irrigation technology also may occur that could change farm labor needs. Changes to the population, crop production, and technology resulting in a decrease in employment opportunities or the duration of employment may create an increased need for social services to provide food, health care, and housing for those facing economic hardship. These needs may be seasonal or could be year-around depending on the extent of the change and the education, training, and technical skills of the population in the area affected.

8.1.6.4 Comparison of the Alternatives with the No Action Alternative

Delta Region

Storage and Conveyance.
The extent of impacts would vary due to the variation in water yield and the opportunity to shift agriculture to various parts of the Delta. The alternatives could result in a significant but perhaps mitigable impact to farmers, farm workers, and agribusiness as a result of agricultural land conversion due to the conveyance and in-Delta storage options. This conversion would result in changes in the number of jobs for farmers, farm workers, and

agribusiness. The intensity of this adverse impact depends on the magnitude of job loss.

Potential job loss numbers are provided in the Regional Economic section of the report. Potential areas of land converted are depicted in Chapter 5 at Section 5.21, 5.22, 5.23 and 5.24.

Ecosystem Restoration Program. Implementation of ecosystem restoration in the Delta would result in the conversion of agricultural lands to restored habitat. This conversion would result in changes in the number of jobs for farmers, farm workers and agribusiness. This job loss would be a potentially significant adverse impact depending on the magnitude of the job loss and extent of mitigation efforts.

The most significant impact would be the concentrated loss of jobs for farm workers who tend to have limited skills. Stress may be put on existing social services, such as welfare and job training, to help provide transitions for displaced farm workers. Because the Delta Region is already experiencing high levels of unemployment and the labor force is primarily farm workers, the social and economic structure of these communities could be adversely affected. Examples may include higher demand for social services, increased crime, and loss of local small businesses such that customers may have to travel further to purchase supplies. Less technically skilled workers and those lacking basic education levels and English language skills may have more difficulty finding new employment.

Although the converted acreage remains constant with ecosystem restoration across alternatives, the loss of jobs decreases as additional water becomes available under Alternatives 2 and 3. Per capita income for displaced farmers and families may decline and could be mitigated by social service and support programs, such as welfare and job training. Farm managers may be required to travel further to their place of employment or move to other areas to gain employment. The need to move or to be away from home and family for longer periods, could add additional burden to family members.

For Delta some ? water avail, For Alt. 1 also ?.

It is anticipated that displaced farm managers and technicians could find work in other regions or other jobs related to agriculture. While there may be a temporary increase in the need for social services to provide training or economic assistance for a portion of these displaced workers, this need would not be expected to be significant.

Levee System Integrity Program. *(Add some discussion)*

Water Quality Program. **[What are they? See 8-68 Internal Review Draft EIS/R].**

Water Use Efficiency Program. During the drought of early 1990s, many communities faced reduced employment resulting from significant reduction in irrigated acreage, which left farm laborers without jobs. To the extent that efficiency improvements would help improve water supply reliability, employment opportunities would be maintained. This would contribute to the stability of many local agricultural communities.

Job opportunities could be created by water use efficiency improvements. As irrigation management improves, so must the knowledge of those irrigating or scheduling irrigations. This would result in the need for more skilled labor, but at higher costs. In addition, the design and installation of new or improved on-farm or district water delivery systems would create more jobs for skilled laborers. It is conceivable that efficiency improvements, especially those that involve physical construction would add to local employment.

However, water use efficiency improvements also could have adverse impacts on farm labor. One benefit of improved irrigation efficiency that may be experienced by a farmer is a reduced need for labor, due either to less cultivation or changes in how crops are irrigated. The addition of

pressurized irrigation systems would have the most substantial impact. With pressurized irrigation, what used to be the job of several workers, could be replaced by just one. It is estimated that as technology advances, 30 percent less labor would be needed to perform the same amount of work. This means that two out of three farm workers may be employed once efficiency measures are implemented.

Improved water use efficiencies often translate to higher crop yields and better quality of farm products. Such advances can increase on-farm direct income, benefitting the farmer's net income. This often translates to additional economic activity. Increased income also can help the overall economy in total sales and purchases and increase tax revenues that strengthen vital functions such as schools, roads, and social and health services.

Water use efficiency improvements also could result in improved crop yields. Improvements in the yield per acre-foot of applied water, even with possible reductions in water supply, would result in greater production of food and fiber on the same land. As populations continue to increase, not only in the state, but in the nation and globally, highly efficient food production would be an asset.

Bay Region

No significant impacts are anticipated to farmers, farm workers or agri-business.

Sacramento River Region

Storage and Conveyance.

Alternative 1C would provide an additional 34,600 acre-feet per year of water. Configuration 2A and 3A would provide an additional 10,000 acre-feet per year and 15,000 acre-feet per year, respectively of water for the Sacramento River Region, Configuration 2B would provide about 34,600 acre-feet per year, Configuration 2D would provide about 17,900 acre-feet per year, and Configuration 2E would provide about 34,600 acre-feet per year. Configurations 3B, 3E, 3H, and 3I would provide about 36,700 acre-feet per year of water. The impacts of this additional water supply could include the development of additional acreage for agriculture, increased water supply reliability resulting in greater farm investments, and shifts to higher water use and higher value crops. Other beneficial impacts include development of additional acreage shifted from the Delta due to land conversion, changes to higher water use and higher value crops, and additional farm worker jobs may become available if additional acreage is developed. The extent of this beneficial impact would vary and would be dependent on the ultimate cost of the water.

Development of the storage and conveyance facilities in Configurations 2B, 2D, 2E, 3B, 3E, 3H, and 3I depending on the location, could require the conversion of agricultural lands resulting in a potentially significant impact to farmers. This impact could be offset by shifting acreage to other parts of the Sacramento River Region. Impacts to farm workers would depend on new acreage developed by farmers. Configuration 2A and 3A would likely result in minimal new jobs, however, Configurations 2B, 2D, 2E, 3B, 3E, and 3H could result in a significant number of jobs and a beneficial impact to farm workers as well as associated agricultural businesses.

Water Transfer Program. The Water Transfer Program would generally have the same beneficial and adverse impacts as identified for the Delta region. However, other potential significant adverse impacts at the transferred water's origin could occur. Agricultural sector workers' incomes could be reduced due to lowered groundwater levels from their own or others' direct groundwater and groundwater substitution transfers that increase costs to pump groundwater; deepen wells; lower pumps; and redrill wells.

Ecosystem Restoration Program. The impacts in this region for Alternatives 1, 2, and 3 would be similar in character to those described for the Delta Region. Ecosystem restoration could result

in conversion or idling of productive agricultural land in the Sacramento River Region. Conversion or idling of agricultural lands would result in a loss of jobs for farmers, farm workers, and agribusiness. The severity of this impact would depend on the magnitude of farm worker job loss and the extent of mitigation efforts.

Water Use Efficiency and Water Transfer Programs. The impacts from the water use efficiency and water transfer programs are the same as discussed under the Delta Region. Additional adverse impacts to local groundwater pumping and facility costs could occur under some conditions of direct groundwater transfers or groundwater substitution transfers.

San Joaquin River Region

Storage and Conveyance.
Configuration 1C would provide an average of up to 166,700 acre-feet per year of additional water supply. Configuration 2A would provide an additional 48,300 acre-feet per year of water for the San Joaquin River Region, Configurations 2B and 2E would provide about 166,700 acre-feet per year, and Configuration 2D would provide about 86,100 acre-feet per year. Configuration 3A would provide an additional 72,500 acre-feet per year of water for the San Joaquin River Region, and Configurations 3B, 3E, 3H and 3I would provide about 177,200 acre-feet per year. The impacts of this additional water supply could include the development of additional acreage, increased water supply reliability, resulting in greater farm investments, and shifts to higher water use and higher value crops. A significant amount of jobs could become available if additional acreage or higher labor demand crops were developed.

Development of the storage and conveyance facilities in Configurations 2B, 2D, 2E, 3A, 3E, 3H, and 3I depending on the location, could require the conversion of agricultural lands resulting in a potentially significant impact to farmers. This impact could be offset by shifting acreage to other parts of the San Joaquin River Region.

Impacts to farm workers would depend on new agricultural acreage developed by farmers. Configurations 2A and 3A would likely result in several new jobs. Configurations 2B, 2D, 2E, 3B, 3E, 3H and 3I could result in a significant number of jobs and a beneficial impact to farm workers as well as associated agricultural business.

Ecosystem Restoration Program. Ecosystem restoration could result in conversion or idling of agricultural land in the San Joaquin River Region. The impacts would be similar in character to those described for the Delta Region.

Water Use Efficiency and Water Transfer Programs. The impacts from the water use efficiency and water transfer programs are the same as those discussed under the Sacramento Region.

Other SWP and CVP Service Areas Outside the Central Valley

Impacts on agriculture in this region are expected to be small. Substantial conversion of agricultural land in the Delta Region could shift some production to desert areas in Southern California, such as the Imperial Valley. The Water Transfer Program would increase agricultural production, incomes, and employment opportunities associated with any transfer that uses the water for agricultural production outside of the Central Valley. The net change in jobs is expected to be minimal, with only minor effects on community stability.

8.1.6.5 Comparison of Program Elements to Existing Conditions

The primary actions that differentiate existing conditions and No Action conditions are the CVPIA and Bay-Delta Accord. These actions are currently being implemented and results forecasted. Therefore, the conclusions regarding the magnitude and significance of impacts would be the same if they are compared to existing conditions as compared to the No Action Alternative.

8.1.6.6 Mitigation Strategies

As discussed in the introduction to this summary, mitigations are proposed as strategies in this programmatic document and are conceptual in nature. Final mitigations would need to be approved by responsible agencies as specific projects are approved by subsequent environmental review.

8.1.6.6 Social Well Being

Strategies for minimizing the social/employment impacts as a result of agricultural land conversion include:

- Continuing the flow of property tax revenues to the local counties, providing opportunities for alternative industries to develop (i.e. recreation) and other economic incentives, relocating facilities and shifting agriculture to new areas;
- Compensate local governments for increased demand for services resulting from labor displacement, compensate workers displaced by specific transfers through such actions as augmenting unemployment insurance benefits;
- Provide training and educational opportunities for unemployed individuals to reenter the workforce; provide job referral and placement services and job retraining;
- Implement cost-sharing and other financial assistance to reduce the social/employment impacts potentially resulting from the cost of water use efficiency and water quality programs;
- Schedule construction activities in a manner so that current crops may be harvested prior to construction initiation;
- Pay fair market value for any crops destroyed or taken out of production on private or leased lands as a result of project construction; and
- Limit the amount of acreage that can be fallowed in a given area.

8.1.6.7 Potentially Significant Unavoidable Impacts

Farm worker job loss may result in adverse unavoidable impacts. In some cases jobs may be shifted to other areas; however, jobs also may be eliminated with no replacement. This would represent a significant unavoidable impact of the CALFED program.

Water Source	Irrigation Applied Water Use by Region (1,000 acre-feet)				
	Delta	Bay	Sacramento River	San Joaquin River	SWP and CVP Service Areas Outside the Central Valley
Local water	1,100	123	1,801	4,854	107
CVP water	85	54	1,467	4,268	0
SWP water	0	13	1	1,168	232
Groundwater	110	544	1,448	1,803	229
	Weighted Average Price ($/af)				
Surface water	0-15	15-45	0-15	20-85	15-255
Groundwater	20-35	60-130	30-60	30-80	80-120

SOURCE:
DWR 1994.

Table 5. Agricultural Water Use and Water Pricing in All Regions, 1985 to 1990

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Region	Year	Number and Size			Ownership Status		
		Number of Farms	Land in Farms (1,000 acres)	Average Farm Size (acres)	Full Owners	Part Owners	Tenants
Delta	1987	4,033	962	238	2,817	691	529
	1992	3,639	900	247	2,525	628	487
Bay	1987	8,377	2,315	276	5,950	1,194	1,233
	1992	7,453	2,261	303	5,306	1,035	1,112
Sacramento River	1987	11,916	4,527	380	8,183	2,160	1,568
	1992	11,507	4,334	377	7,786	2,093	1,629
San Joaquin River	1987	28,742	10,095	351	20,942	4,610	3,730
	1992	26,731	9,656	361	9,144	4,420	3,168
SWP and CVP Service Areas Outside the Central Valley	1987	21,281	6,279	295	16,744	1,837	2,700
	1992	19,899	5,488	276	16,063	1,639	2,197

SOURCES:
Census 1989 and 1994.

Table 7. Number of Farms, Farm Sizes, and Farm Ownership in All Regions, 1987 and 1992

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(This table needs to be moved to Econ. And Social Affected Env. Section and table # changed)

Region	Year	Total Farm Income (million dollars)				Total Production Expenses (million dollars)				Net Cash Return (million dollars)
		Agric. Product Value	Other Revenue	Total	Livestock Related	Fertilizers and Chemicals	Hired and Contract Labor	Other	Total	
Delta	1987	496	12	508	81	38	97	169	385	123
	1992	590	10	600	89	48	128	209	474	126
Bay	1987	845	2	847	102	36	255	281	674	173
	1992	1,065	6	1,071	105	53	338	335	831	240
Sacramento River	1987	1,515	145	1,660	126	140	252	525	1,043	617
	1992	1,394	183	1,577	147	180	316	630	1,273	304
San Joaquin River	1987	6,565	222	6,787	1,276	531	1,337	2,197	5,341	1,446
	1992	8,089	308	8397	1,780	670	1,691	2,736	6,877	1,520
SWP and CVP Service Areas	1987	3,743	30	3,773	872	185	842	1,044	2,943	830
	1992	4,295	29	4,324	904	222	1,072	1,312	3,510	814

SOURCES:
Census 1989, 1994.

Table 8.1.1-1 **Farm Income and Production Expense in All Regions, 1987 and 1992**

Region	Year	Total Farm Income (million dollars)				Total Production Expenses (million dollars)				Net Cash Return (million dollars)
		Agric. Product Value	Other Revenue	Total	Livestock Related	Fertilizers and Chemicals	Hired and Contract Labor	Other	Total	
Delta	1987	496	12	508	81	38	97	169	385	123
	1992	590	10	600	89	48	128	209	474	126
Bay	1987	845	2	847	102	36	255	281	674	173
	1992	1,065	6	1,071	105	53	338	335	831	240
Sacramento River	1987	1,515	145	1,660	126	140	252	525	1,043	617
	1992	1,394	183	1,577	147	180	316	630	1,273	304
San Joaquin River	1987	6,565	222	6,787	1,276	531	1,337	2,197	5,341	1,446
	1992	8,089	308	8397	1,780	670	1,691	2,736	6,877	1,520
SWP and CVP Service Areas Outside the Central Valley	1987	3,743	30	3,773	872	185	842	1,044	2,943	830
	1992	4,295	29	4,324	904	222	1,072	1,312	3,510	814

SOURCES:
Census 1989 and 1994.

Table 8. Farm Income and Production Expense in All Regions, 1987 and 1992

Region	Approximate Acres of Agriculture in Region	Percent of Region
Delta Region	546,270	63
Bay Region	61,400	2
Sacramento River Region	2,145,000	11
San Joaquin River Region	6,355,000	31
SWP and CVP Service Areas	840,500	4
Total for Study Area	**9,948,170**	

SOURCES:
DWR 1991, 1994a, and 1994b.

Table 9. Agricultural Land Use in All Regions

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Region	Ethnicity (percentage)			
	White	Black	Asian	Hispanic
Delta Region	68	8	9	14
Bay Region	61	8	15	16
Sacramento River Region	82	4	5	10
San Joaquin River Region	62	4	6	30
SWP and CVP Service Areas Outside the Central Valley	52	9	9	30

SOURCE:
California Department of Finance 1993

Table 14. Ethnicity by Region

Region	Hispanic	White	Black	American Indian/Eskimo Aleutian	Asian Pacific/ Islander	Total Number of Farm Workers
Delta	77%	15.1%	0.8%	0.3%	6.5%	5,470
Bay	82.2%	14.4%	1%	0%	2.2%	12,230
Sacramento River	58.9%	30.9%	0.4%	1%	8.2%	11,560
San Joaquin River	84%	11.9%	0.3%	0.2%	3.4%	74,220
SWP and CVP Service Areas Outside the Central Valley	86.9%	10.1%	.9%	.2%	1.7%	44,960
Totals	**122,490**	**19,500**	**840**	**400**	**4,860**	**148,440**

SOURCE:
1990 Census of Population and Housing.

Table 15. Racial Distribution of Farm Workers by Region

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Crop Category	Delta Region		Bay Region		Sacramento River Region		San Joaquin River Region		SWP and CVP Service Areas Outside the Central Valley	
	Irrigated Acres (1,000 acres)	Production Value (million dollars)	Irrigated Acres (1,000 acres)	Production Value (million dollars)	Irrigated Acres (1,000 acres)	Production Value (million dollars)	Irrigated Acres (1,000 acres)	Production Value (million dollars)	Irrigated Acres (1,000 acres)	Production Value (million dollars)
Pasture	37	4	15	2	189	19	290	34	185	15
Rice	11	9	50	9	161	68	527	374	420	258
Truck crops	28	77	0	0	28	25	51	54	,32	40
Tomatoes	45	91	16	10	335	176	786	532	154	67
Alfalfa	65	37	0	0	469	394	18	12	0	0
Sugar beets	15	13	47	280	16	31	301	982	289	1,514
Field crops	151	76	4	10	135	234	180	433	8	47
Orchards	61	177	26	148	265	578	668	2,074	22	343
Grains	60	16	14	3	175	43	344	103	146	47
Grapes	36	127	70	316	10	42	507	1,681	37	215
Cotton	0	0	0	0	4	2	1,269	1,153	20	19
Subtropical orchards	0	0	0	0	15	30	221	973	167	842
Total	**509**	**628**	**244**	**779**	**1,803**	**1,642**	**5,162**	**8,403**	**1,481**	**3,408**

SOURCES:
CAC reports various years.

Table 6. Irrigated Acres and Production Value in All Regions, 1986 to 1995

Irrigated ≠ Important Farmland

	Delta	Bay	San Joaquin	Sacramento	CVP and SWP Service Areas Outside the Central Valley
1996 Population[a]	2,362,514	5,498,964	3,004,222	1,666,650	19,159,450
Economic Indicators					
Median Family Income (1989)[b]	40,690	46,373	30,862	31,794	38,825
Per Capita Income[c] (1994)	21,991	28,079	16,475	18,313	20, 358
Poverty Rate[d]	11%	9%	18%	13%	13%
1995 Unemployment Rate[e] Average Range	 7.8% 5.8 to 12.3%	 6.6% 4.3 to 13.5%	 13.3% 8.2 to 16.9%	 11.2% 6.1 to 19.7%	 10% 5.1 to 28.8%

NOTES:
[a] Source: California Department of Finance, County Population Data, aggregated into CALFED Regions according to Table 1.
[b] Source: California Department of Finance, Median Family Income for each county was averaged to show average median family income for each CALFED region.
[c] Source: California Department of Finance, Per Capital Income for each county was averaged to show average per capita income for each CALFED region.
[d] Poverty Rate
[e] Source: California Department of Finance; Average of counties within each CALFED Region

Table 8.1.1-2 Existing Conditions: Regional Demographics and Economic Indicators of Social Well Being

Selected Locations	In Total Dissolved Solids (TDS, in ppm)											
	No Action, 1A, 1B			Alternative 1C			Alternative 2B			Alternative 2D		
	Low	Average	High	Low	Average	High	Low	Average	High	Low	Average	High
Middle Delta	109	139	207	112	148	206	106	123	137	106	124	141
Delta Export Pumps	217	278	366	185	235	356	175	193	216	163	191	215
South Delta	282	331	389	226	320	395	221	318	395	247	326	395
Selected Locations	**Alternative 2E**			**Alternative 3A**			**Alternative 3B**			**Alternative 3E, 3H, 3I**		
	Low	Average	High	Low	Average	High	Low	Average	High	Low	Average	High
Middle Delta	104	121	135	132	185	254	134	186	254	179	240	270
Delta Export Pumps	164	190	214	112	149	185	112	143	176	100	127	177
South Delta	248	326	395	310	373	448	328	378	448	301	346	395
	In Electrical Conductivity (ED, in mmho/cm)											
Selected Locations	**No Action, 1A, 1B**			**Alternative 1C**			**Alternative 2B**			**Alternative 2D**		
	Low	Average	High	Low	Average	High	Low	Average	High	Low	Average	High
Middle Delta	0.17	0.22	0.32	0.18	0.23	0.32	0.17	0.19	0.21	0.17	0.19	0.22
Delta Export Pumps	0.34	0.43	0.57	0.29	0.37	0.56	0.27	0.30	0.34	0.25	0.30	0.34
South Delta	0.44	0.52	0.61	0.35	0.50	0.62	0.35	0.50	0.62	0.39	0.51	0.62
Selected Locations	**Alternative 2E**			**Alternative 3A**			**Alternative 3B**			**Alternative 3E, 3H, 3I**		
	Low	Average	High	Low	Average	High	Low	Average	High	Low	Average	High
Middle Delta	0.16	0.19	0.21	0.21	0.29	0.40	0.21	0.29	0.40	0.28	0.37	0.42
Delta Export Pumps	0.26	0.30	0.33	0.18	0.23	0.29	0.18	0.22	0.28	0.16	0.20	0.28
South Delta	0.39	0.51	0.62	0.48	0.58	0.70	0.51	0.59	0.70	0.47	0.54	0.62

NOTES:
1. EC = TDS/640 is used to convert TDS to EC.
2. Data for Alternatives 2A are not available.
3. Middle Delta location is Prisoner's Point; South Delta location is Old River at Middle River. Tracy Pumping Plant is export location.

SOURCE: Status Reports on Technical Studies for the CALFED Alternatives, DWR, 1997.

Table 8.1.3-2 Estimated Salinity of Irrigation Water in Selected Locations, by Alternative (During Irrigation Season: April to September)

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