6 Land and Water Use/Development Trends

The demand and management of water for consumptive, economic, recreation, and flood control in the Sacramento Valley continues and will continue to be driven by agricultural demand, increased urbanization, and maintenance/enhancement of environmental resources throughout the region. The region's generally high quality of life and natural amenities continue to encourage urbanization in the valley's existing cities, towns, and adjacent rural areas. A trend toward increased use of groundwater to meet urban development and additional orchard crop demand occurring in many parts of the valley will require that regional leaders manage this resource properly. Increased urbanization also requires that water managers and agencies ensure that development, planning, and facilities are managed and improved to ensure maximum flood protection and maintenance of high-quality water.

Typically, the majority of new development in the valley continues to rely on groundwater for their water supply, even in areas where development is displacing agricultural lands that have historically used surface water or a combination of surface water and groundwater. Additionally, orchard planting is also increasing demand for groundwater to provide for drip system reliability. Finally, the use of additional groundwater is proposed to allow for a proportionate decrease in surface water diversions to support environmental and water quality-related goals and objectives. Efforts continue across the valley to ensure water quality remains excellent to support existing uses and additional urbanization.

This section provides a summary of land use trends in the Sacramento Valley IRWMP Region and initial steps toward coordinating regional water planning efforts with land use decisions throughout the valley. In some cases, integration of land use and water planning is already occurring in the region within and across counties. Ongoing water management strategies are documented for each county, and next steps and/or recommendations identified. Land and water use information was gathered from the Department, the Farmland Mapping and Monitoring Program (FMMP), and local water districts and purveyors. General county and city planning documents, specific plans, community plans, master planning documents, and water use conditions. County officials and water interests were interviewed to gain insight into land use and water management strategies for each county.

Each county within the Sacramento Valley IRWMP Region is unique, and water and land use data and planning vary greatly from county to county. Those counties with engaged leaders, greater growth pressure, and/or unique political circumstances have in some cases completed detailed planning and/or have made significant progress toward inventorying the current and projected land and water use. Other areas or counties continue to pursue funding to support necessary efforts to stay ahead of rapidly changing land and water uses.

The following land and water use sections reflect these unique county planning differences. The planning horizon for most counties is 2030, to maintain consistency with the California Water Plan; however, some counties use other planning horizons or determined that water and land use projections were not valid or reliable in the 20- to 30-year planning horizon. The following county discussions follow a similar format, but the level of detail provided varies with the level of planning completed for each county.

6.1 Shasta County

The following summarizes the local setting, current and future land and water use, and primary recommendations in the Shasta County and Redding Basin area. The area included as part of this IRWMP (which encompasses the Redding Groundwater Basin) is referred to as the "Redding Basin." Shasta County officials were interviewed and consulted as a part of the development of this IRWMP and identified the following key and/or highest priority water-and land use related issues (Wedemeyer, 2006):

- 1. Completion of the environmental document for the Redding Basin Water Resources Management Plan.
- 2. Completion of the SB1938 update of the AB3030 plan.
- 3. Improvement of water supply reliability for outlying water service contractors that are dependent on CVP contracts.
- 4. Development of BMOs, which would be based on approved water transfers among purveyors within the Redding Basin (dependent on Issue No. 1).

6.1.1 Local Setting

Shasta County is an area of diverse topography, land uses, and hydrologic features. Approximately 6.5 percent of all surface runoff in California originates in Shasta County. (Shasta County, 2004). The majority of water supply in the county originates from surface water derived from runoff from the surrounding mountains. Two significant groundwater basins also lie beneath Shasta County. The Redding Basin is located in the south-central portion of the county, and the Fall River Groundwater Basin is located in eastern Shasta County.

The county is characterized by the urbanized Redding Basin and more rural outlying areas to the north, west, and east of the Redding Basin. The Redding Basin is the only portion of the county that falls within the Sacramento Valley IRWMP Region and includes the county's three cities: Redding, Anderson, and the City of Shasta Lake. However, in-county watersheds outside of the Redding Basin generally drain to the Sacramento River. The basin has a population of about 150,000 people, encompasses approximately 275,000 acres, and includes the service areas of the water purveyors shown on Figure 6.1-1. (Figures in Section 6 are located at the end of each county subsection.) The Redding Basin is bisected by the

Sacramento River and overlies one of the state's largest groundwater basins. However, beginning in the early 1990s, Redding-area surface water purveyors have been subject to seasonal shortages because of cutbacks in their supply allocations. Purveyors at the western, northern, and eastern margins of the Redding Basin area are largely dependent on CVP surface water contracts with the federal government, which are subject to cutbacks when supplies are inadequate to meet all contractual obligations. Purveyors that pump groundwater in these same areas have experienced reduced well yields during extended dry periods.

Local water purveyors who contract with Reclamation for all or part of their water supply were subject to cutbacks of up to 75 percent in recent drought periods. Cutbacks in supply have even occurred during periods of average precipitation and runoff. Reductions in supply are becoming more common as additional demands are placed on the state's water supply systems.

Numerous water agencies and districts oversee the provision and development of water supplies in Shasta County. These include the following agricultural water purveyors, urban water purveyors, agencies with flood management responsibilities, agencies with land use management responsibilities, and others:

• Agricultural Water Purveyors

- Anderson-Cottonwood Irrigation District
- Bella Vista Water District
- Clear Creek Community Services District

• Urban Water Purveyors

- City of Redding
- City of Anderson
- City of Shasta Lake
- Bella Vista Water District
- Centerville Community Services District
- Clear Creek Community Services District
- Cottonwood Water District
- Jones Valley County Service Area
- Keswick County Service Area
- Mountain Gate Community Services District
- Shasta Community Services District

• Flood Management Agencies

- U.S. Army Corp of Engineers
- California Department of Water Resources
- County of Shasta

• Land Use and Resource Agencies

- Shasta County
- Shasta County Resource Conservation District
- Public Trust Agencies
- Others
 - Shasta County Water Agency
 - McConnell Foundation

6.1.2 Land Use Patterns

On a regional scale, the Redding Basin is the primary area within Shasta County where land use changes are anticipated to result in significant future water management concerns. Given the potential for substantial future land and water use changes in the Redding Basin area, local interests and agencies prepared the *Shasta County Water Resources Master Plan Phase I Report, Current and Future Water Needs* (Shasta County et al., 1997). The plan included mapping conducted by the Department that was verified by the Redding Basin purveyors and the study team (see Figure 6.1-2).

Approximately 40 percent of Shasta County is public land, and 97 percent of the unincorporated areas are presently undeveloped (Department, 1995a). Projections indicate that less than significant changes are expected at this time in areas outside the Redding Basin. Shifts in cropping trends, especially in northeastern Shasta County could impact water management, but local purveyors do not anticipate such shifts in the foreseeable future. Figure 6.1-3 illustrates the relative gross value of the leading agricultural commodities in Shasta County.

6.1.3 Water Use and Water Supply Patterns

The Redding Basin encompasses about 275,000 acres within south-central Shasta County and northern Tehama County. All three cities within the Redding Basin (Redding, Anderson, and Shasta Lake) operate their own water systems, which serve most of the water users within their incorporated areas. The City of Redding is the largest city in the basin. ACID's service area overlies a portion of the service area for Redding, Anderson, and the Town of Cottonwood. Other water purveyors serve suburban customers in areas surrounding the three cities (Shasta County Water Agency et al., 2003).

The City of Redding derives its water supply from surface water and groundwater sources. Surface water is drawn from the Sacramento River and Whiskeytown Lake. About onequarter of the city's water supply is drawn from wells located in the Redding Groundwater Basin. Redding uses groundwater as a supplement to surface water, and increases groundwater production in response to drought, as necessary. Optimizing use of the three supply sources through existing infrastructure is challenging with Redding's growing population, particularly during dry periods when surface water supplies are cut back. The City of Anderson relies solely on groundwater to meet its customers' needs, as does the Town of Cottonwood. The City of Shasta Lake receives all of its water from two ports on Shasta Dam taken directly from Shasta Reservoir.

The Bella Vista Water District and Mountain Gate Community Services District rely primarily on surface water, but both districts also have access to groundwater, although groundwater supplies are considered unreliable during drought conditions. All other Redding Basin purveyors (Centerville Community Services District, Clear Creek Community Services District, Jones Valley County Service Area, Keswick County Service Area, and Shasta Community Services District) rely solely on surface water supplied through CVP facilities. The amount of groundwater available to these purveyors is very small, not sufficient to supplement the available surface water supply in dry periods.

Current water supplies in the Redding Basin are inadequate to meet the needs of some purveyors during critically dry-year conditions. Cumulative shortages of 26,500 ac-ft were experienced as a result of CVP supply cutbacks during 1995 (an average runoff year). Without additional water supplies, the affected purveyors will be subject to more frequent and more severe supply shortages in the future. An EIS/EIR report is currently underway that would allow water sharing from a common pool within the Redding Basin. The environmental document also contemplates a system of groundwater substitution transfers within the Redding Basin to supplement the surface water supply.

6.1.4 Existing and Ongoing Planning

In the past decade, the Shasta County water purveyors have taken several steps toward preparing for future land use changes and their associated water demands. The Shasta County Water Agency implemented a multi-phase water planning effort beginning with the *Shasta County Water Resources Master Plan Phase I Report, Current and Future Water Needs*. This report was published in October 1997, and included a comprehensive look at the current and future water needs for the county through year 2030. The most recent phase of water planning for Shasta County has focused on the Redding Basin. The *Redding Basin Water Resources Management Plan Phase 2C Report* provides an in-depth look at the problems and alternative solutions to water management in the Redding Basin. Because the Sacramento Valley IRWMP is an integration of the entire Sacramento Valley Region, land use will be assessed at a regional level. A complete history of land use and water planning efforts in Shasta County Web site (http://www.co.shasta.ca.us/departments/publicworks/new-wa.shtml). Table 6.1-1 provides a summary of the existing planning documents for the Shasta County IRWMP area.

6.1.5 Plan Areas

The Shasta County Water Resources Master Plan Phase 1 Report, Current and Future Needs report identified five specific areas of investigation, which were largely based on Department

study areas referred to as Detailed Analysis Units (DAU). As described above, the area included as part of this IRWMP (which encompasses the Redding Groundwater Basin) is referred to as the "Redding Basin." The outlying areas of Shasta County beyond the Redding Basin are described in detail in the *Shasta County Water Resources Master Plan Phase 1 Report, Current and Future Needs.*

TABLE 6.1-1

Existing and Relevant Shasta County Water Resource Planning Documents

Planning Document	Description	Date Published
City of Redding Water Master Plan 2000	Contains water use projections for the City of Redding to 2040.	May 2001
Redding Basin Water Resources Management Plan Phase 2C Report	Contains detailed projections for Redding Basin purveyor supplies and demands to 2030.	August 2003
Shasta County Water Resources Master Plan Phase 1 Report, Current and Future Needs	Contains detailed projections for water use through 2030.	October 1997
Shasta County Groundwater Management Plan	AB3030 Groundwater Management Plan.	1998
Sacramento River Basinwide Water Management Plan	Contains current and future water requirements for all Sacramento River diverters (includes Shasta County).	October 2004
City of Redding General Plan	Surface water and groundwater resources section (2000-2020).	October 2000

6.1.5.1 Existing Land Use Condition

Land uses were mapped for each water purveyor and for private users in the Redding Basin. Figure 6.1-2 shows land use in the Redding Basin. A total of 55,300 acres of lands using water were mapped in the Redding Basin. Irrigated agriculture accounts for 23,300 acres (42.1 percent) of the total. Urban, commercial, and industrial uses account for 27,000 acres (48.8 percent) of the total. Recreation uses, including water bodies, parks and golf courses, and riparian vegetation areas, total 5,000 acres (9.1 percent). Table 6.1-2 shows land use in the Redding Basin and Shasta County by acre.

6.1.5.2 Future Land Use Condition (2030)

Land use in the Redding Basin subarea will likely incur more land use change than the other part of the county by 2030. Shasta County population is projected to be 260,160 by 2030 (California Department of Finance, 2004), which represents an approximate 43 percent increase from current levels. The population centers of Redding, Anderson, Shasta Lake City, and the Town of Cottonwood will continue to expand, and land will be developed for urban uses from other categories in accordance with local general plans.

Land Use in the Redding Basin and Shasta County					
Land Use Category	Redding Basin Total (acres)	Shasta County Total (acres)			
Irrigated Agriculture ^a	23,255	63,868			
Urban	22,856	32,320			
Commercial and Industrial	4,170	5,622			
Recreational and Environmental ^b	4,985	49,232			
Non-water using lands ^c	204,293	2,316,294			

TABLE 6.1-2

^aIncludes permanent crops, grain and field crops, pasture, truck crops, rice crops, and rural urban crops (in acres)

^bIncludes water bodies, parks and gold courses, and riparian vegetation

^cIncludes native, idle, and rural urban nonirrigated crops (1 to 5 acres)

6.1.5.3 Existing Water Use Condition

As described above, the Redding Basin is heavily dependent on surface water, with agriculture being the largest user of water in the basin. Table 6.1-3 identifies current water use by category.

TABLE 6.1-3

Existing Water Use in the Redding Basin

Land/Water Use Category	Total (ac-ft)
Irrigated Agriculture	101,120
Urban	31,680
Commercial and Industrial	19,820
Recreational and Environmental	13,720
Diversion to Tehama County	30,000
Conveyance Loss	84,160

Source: Shasta County Water Resources Master Plan Phase 1 Report, Current and Future Needs

6.1.5.4 Future Water Use Conditions (2030)

Future water use projections indicate that agricultural use will likely remain generally stable, but urban uses will likely increase substantially as the population grows and land is developed. Table 6.1-4 summarizes the future annual water needs for the Redding Basin.

	Redding Basin (DAUs 141 and 143)				
Category	1995	2010	2030		
Future Trends					
Population Projections	130,225	197,375	260,160		
Agricultural Water Use	Slight shifts in land and water use. Flat trend.				
Urban and Commercial Water Use	Increasing trend in proportion to population trend.				
Industrial Water Use	Increase at 3 percent per year.				
Recreation and Environmental Water Use	Increasing because of population regulation trends.				
	Agricultural systems and losses unchanged.				
Conveyance Losses	Urban, commercial, and industrial systems expanded.				
Diversions to Other Counties	Continue ACID diversions to Tehama County (20,000 af/yr) and to downstream Sacramento River users (10,000 af/yr).				
Future Water Needs (af/yr)					
Agriculture Demands	101,100	101,100	101,100		
Urban and Commercial ^a Demands	33,400	46,500	61,600		
Industrial Demands	18,100	26,200	37,100		
Recreation and Environmental Demands	13,700	19,100	25,300		
Conveyance Losses	84,160	85,560	87,250		
Diversions to Other Counties	30,000	30,000	30,000		
Total Needs	280,460	308,460	342,350		

TABLE 6.1-4

Future Annual Water Needs in the Redding Basin

^aDepartment Population Data for Bulletin 160-98

Source: Shasta County Water Resources Master Plan Phase 1, Current and Future Needs

Table 6.1-5 represents projected (2030) water demand versus water supply by purveyor in the Redding Basin. The table was created from data and assumptions stated in the *Redding Basin Water Resources Management Plan Phase 2C Report* and updated Reclamation contract renewals.

TABLE 6.1-5

Water Demand Versus Water Supply by Purveyor in the Redding Basin (2030 Level of Development)

11,5,5	,	0	1		/	
	Normal Water Year (ac-ft)			Critically Dry Water Year (ac-ft)		
Purveyor	Demand	Supply	Surplus (Deficit)	Demand	Supply	Surplus (Deficit)
Mountain Gate	1,900	1,950	50	1,710	810	(900)
Jones Valley County Service Area	400	540	140	360	324	(36)
Shasta Lake	6,200	4,400 ^a	(1,800)	5,580	2,640	(2,940)
Keswick County Service Area	300	500	200	270	300	30

	Normal Water Year (ac-ft)		Critically Dry Water Year (ac-ft)			
Purveyor	Demand	Supply	Surplus (Deficit)	Demand	Supply	Surplus (Deficit)
Centerville Community Service District	3,600	2,900	(700)	3,240	2,100	(1,140)
Shasta Community Service District	1,900	1,000 ^a	(900)	1,710	600	(1,110)
Clear Creek Community Service District	10,600	15,300	4,700	8,904	5,508	(3,396)
Redding ^b	62,000	62,000	0	55,800	55,800	0
Bella Vista Water District	26,800	28,478	1,678	21,976	8,324	(13,652)
Anderson-Cottonwood Irrigation District	118,000	118,000	0	88,500	88,500	0
Cottonwood Water District ^c	1,100	1,100	0	990	990	0
Anderson ^c	5,400	5,400	0	4,860	4,860	0
Shasta County Water Agencyd		1,022	1,022		613	613
McConnell		5,100	5,100		5,100	5,100
			9,490			(17,431)

TABLE 6.1-5

Water Demand Versus Water Supply by Purveyor in the Redding Basin (2030 Level of Development)

^aDraft contracts for 3,000+ ac-ft in progress (subject to change)

^bCity of Redding assumed to pump groundwater to meet demand

^cGroundwater only (reported in ac-ft)

^dShasta County Water Agency contracts water to other purveyors in the Redding Basin

6.1.6 Local Water Management Issues and Strategies

6.1.6.1 Conjunctive Management and Groundwater Storage

As described above, the Redding Basin is heavily dependent on surface water from CVP water contracts. Because these contracts are subject to major cutbacks in critically dry years, water purveyors are increasingly looking toward groundwater production to help increase water supply reliability. Redding, Anderson, and Cottonwood will continue to expand groundwater pumping capacity as their respective communities grow. Groundwater management will become increasingly important as more demand is placed on the local aquifer. Protecting groundwater supply, preventing groundwater export, and protecting groundwater quality are high priorities for Shasta County. Shasta County has completed a Groundwater Management Plan (AB3030) for the Redding Groundwater Basin (November 1998) and is working toward SB1938 compliance.

The ACID is continuing to develop a conjunctive water management and monitoring program to supplement current surface supplies and reduce Sacramento River diversions.

Water produced as part of this project is proposed to be dedicated to meeting water quality standards in the Bay-Delta and improve local, regional, and statewide water supply reliability depending on year type in accordance with the SVWMA. Further detail on the SVWMA and the project are provided in Section 1, Introduction, and Section 4, Assessment of Water Management Strategies, of this IRWMP.

6.1.6.2 Water Supply Reliability

As previously stated, the Redding Basin is heavily dependent on CVP water supply contracts with Reclamation. Current water supplies are inadequate to meet the needs of some purveyors during critical dry-year conditions. Phase 3 of the Redding Basin Water Resources Management Plan identifies several alternatives involving a common pool to support increased water reliability. The proposed groundwater production project identified above would also improve flexibility and reliability of water supply while helping to reduce local and regional conflict.

6.1.6.3 Water Transfers

In an effort to minimize impacts of drought on all Redding Basin water users, the Shasta County Water Agency is working on a plan to create a common pool of water to transfer among Redding Basin purveyors. A pre-approved water management plan that allows for water transfers among purveyors would help minimize disruption to water customers and ensure maximum beneficial use of available water allocations.

6.1.6.4 Agricultural Water Use Efficiency

The ACID has implemented a canal modernization program to increase agricultural water use efficiency. This program is being implemented in phases as funding sources become available and is identified in Section 4, Assessment of Water Management Strategies, of this IRWMP. The modernization program includes installation or upgrading of control structures and canal lining in some sections of the Main Canal. The water use efficiency program is also being considered as an alternative for the Redding Basin Water Resources Management Plan to possibly contribute to a basinwide common pool.

6.1.6.5 Ecosystem Restoration

Water management strategies in the Redding Basin are consistently focused on aquatic ecosystem restoration and maintenance. The Redding Basin is home to one of the finest blue ribbon trout ecosystems and salmon habitats remaining in California. Millions of taxpayer dollars have been spent in the Redding Basin to improve aquatic ecosystem health and improve fish passage and spawning habitat. The ACID fish passage and viewing ladder in Caldwell Park has opened up a significant amount of spawning habitat for endangered Chinook salmon. The Clear Creek restoration project is viewed as a model for restoration throughout the state. From bank stabilization projects to gravel injection sites, Shasta County

government and residents consider ecosystem restoration and environmental protection a top priority.

6.1.7 Next Steps/Recommendations

Next steps/recommendations are as follows:

- 1. Complete the Redding Basin Water Resources Management Plan EIS/EIR.
- 2. Establish BMOs or similar approach to assist in evaluating groundwater levels and avoiding potential impacts.
- 3. Conduct recharge area mapping and work with local and county planning agencies to protect recharge areas.
- 4. Support implementation of the ACID Water Management Program.
- 5. Continue to work with surrounding counties and water purveyors to share ideas and information.
- 6. Continue to support proposed projects within Shasta County as detailed in Appendix B to this IRWMP.





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Cattle

- Hay
- Nursery/strawberry
- Pasture, range
- Pasture, irrigated
- Other livestock
- Apiary

Source: United States Department of Agriculture National Agricultural Statistics Service, 2006a

FIGURE 6.1-3 SHASTA COUNTY LEADING AGRICULTURAL COMMODITIES SACRAMENTO VALLEY IRWMP

WB082006010RDD_03 (8/30/06)