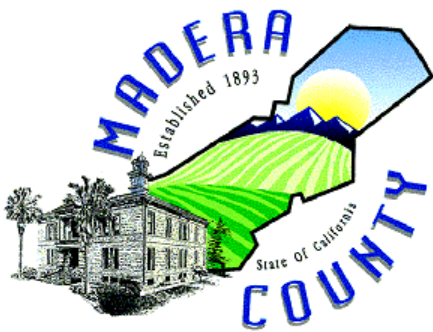


Integrated Regional Water Management Plan

Volume 1



April 2008



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In association with
Kenneth D. Schmidt and Associates

Integrated Regional Water Management Plan Volume 1

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Acknowledgements

In 2006, the County of Madera began the process of developing an integrated countywide plan for managing and protecting its water resources. The need for such a plan is driven by the ever-increasing pressure being put on the County's limited water supply by continued growth and the potential reallocation of water supplies for environmental purposes. The undertaking required an open process that sought the ideas of all of its citizens from all regions of the County.

The success of this Integrated Regional Water Management Plan (Plan) is owed to the individuals who generously shared their talents and expertise during this long process. Numerous staff members of the County and various municipalities, agencies and groups throughout the County provided input and information for this Plan. Five public Advisory Committees (Coarsegold, North Fork, Oakhurst, Raymond, and Valley Floor) were also formed to assist in the deliberation of issues addressed in this Plan. The Advisory Committees were comprised of over 80 individuals representing various agencies, community organizations, municipalities, and irrigation and water districts, as well as private citizens.

A special thanks is extended to Tom Wheeler, Madera County Supervisor District 5, for his tremendous support of the project and countless hours spent attending the various Advisory Committee meetings throughout the County.

The following is a list of the members of the Advisory Committees that played such an important role in the development of this Plan. The County regrets and apologizes if any name has been inadvertently left off the list.

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Executive Summary

The water users in Madera County have historically relied on groundwater to meet their domestic water demand and a large portion of their agricultural water demand. This continued reliance is straining groundwater supplies. Also, many areas of the valley floor of the County are prone to flooding, requiring a comprehensive water management approach. This Integrated Regional Water Management Plan (IRWMP or Plan), funded by AB 303 and Proposition 50 Study Grants from the California Department of Water Resources (DWR), documents the collective approach of the County and its stakeholders to water management to deal with water supply, water quality, and flood management through 2030.

The main objectives of the IRWMP are water resource management optimization, evaluating and increasing water supplies, water quality protection and improvement, and flood control planning. The water management information collected as part of this IRWMP will help in updating the County's General Plan and will assist the County in meeting the goals and objectives of its AB 3030 Groundwater Management Plan.

Five Advisory Committees assisted the County and its consulting team in the deliberation of issues addressed in this Plan. The committees included over 80 individuals representing community organizations, municipalities, irrigation and water districts, and nondistricted areas.

Description of Study Area

The County is located in the geographic center of California in the Central San Joaquin Valley as shown in Figure ES-1. It covers approximately 2,147 square miles (1.4 million acres). It has been divided into two main study regions, as shown in Figure ES-2, in recognition of hydrogeologic differences. The relatively flat-lying western third of the County, which overlies alluvial groundwater basins, is referred to as the *Valley Floor*, and the remaining eastern two-thirds, which consists of the foothills and mountains of the Sierra Nevada, is referred to as the *Foothills and Mountains*. The Plan includes focused hydrogeologic studies of four areas in the Foothills and Mountains, including Oakhurst, Coarsegold, North Fork, and Raymond-Hensley Lake, as shown in Figure ES-2.

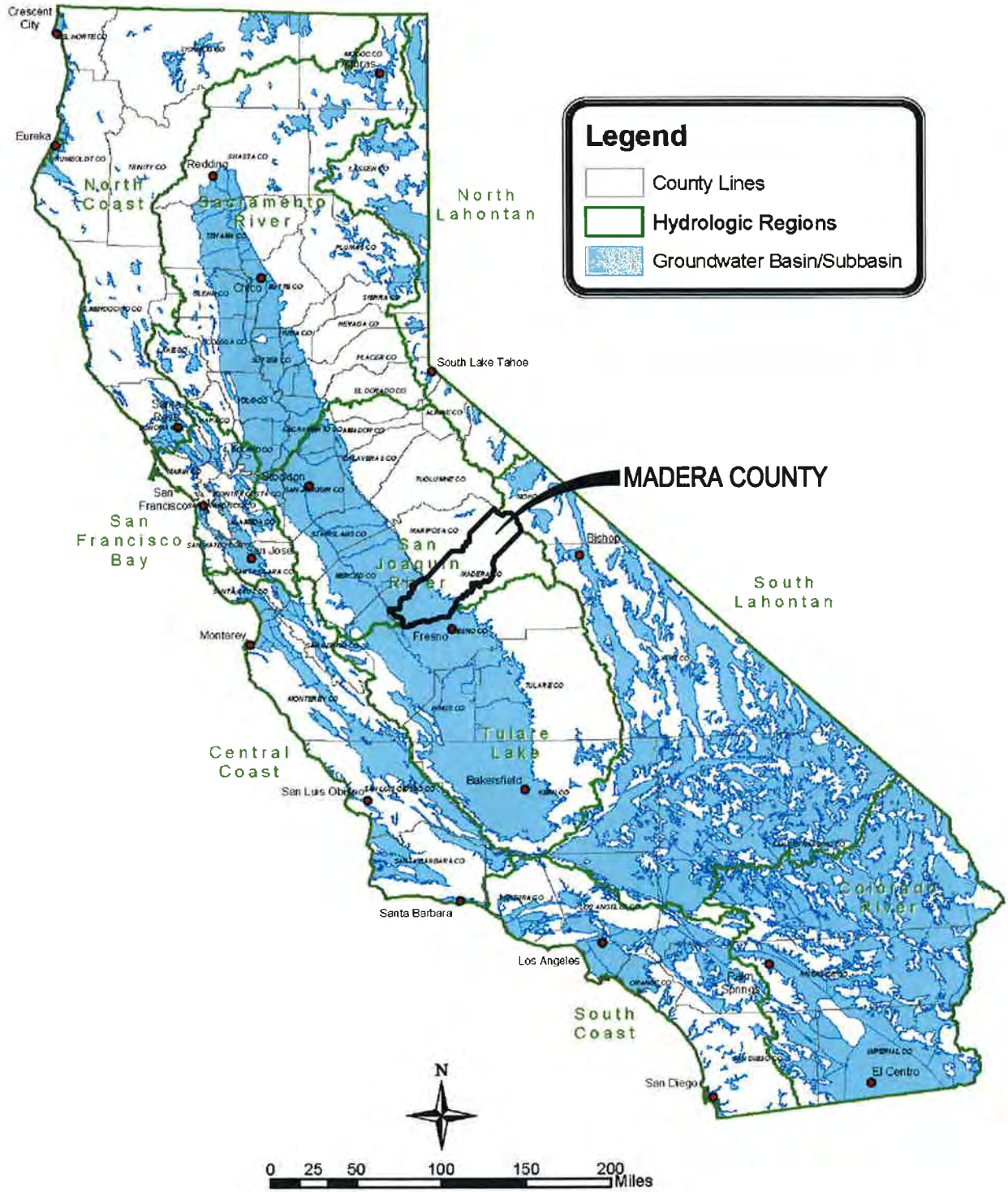
The County is one of the fastest growing areas in California, with growth averaging 3 percent per year from 2000 to 2007. Its current population of approximately 148,700 is anticipated to almost double to approximately 273,000 by 2030 based on projections by the California Department of Finance. According to Madera County Planning Department estimates based on area-specific plans, the population of the County is more likely to be approximately 355,000 by 2030.

The main land uses in the County include agricultural, open space, residential, commercial/institutional, industrial, and irrigated landscape. Agriculture comprises 53 percent of the land use with open space at 38 percent. The remaining land uses comprise approximately 9 percent of the total land area.

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SOURCE: DWR, 2003

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MANAGEMENT PLAN

COUNTY LOCATION MAP

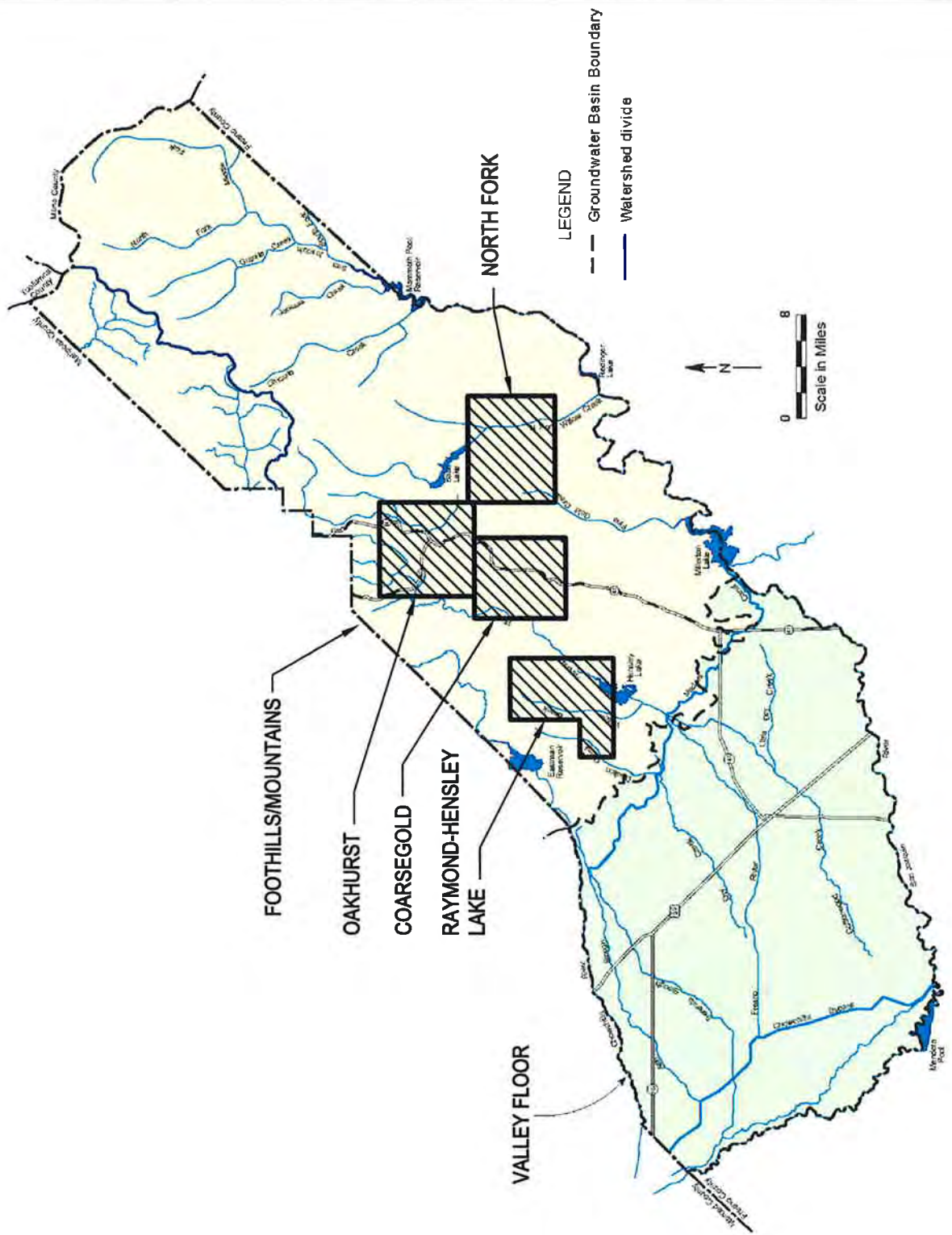
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FIGURE

ES-1

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LOCATION OF STUDY SUBAREAS

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FIGURE

ES-2

Runoff from rainfall and snowmelt feeds the rivers, lakes, and reservoirs in the County. The San Joaquin River forms most of the southern and western boundaries of Madera County and ultimately serves as the discharge point for runoff from about 90 percent of the County (including the Fresno River and Chowchilla River basins). Less than 10 percent of precipitation and stream flow originating in Madera County drains out of the County to another river system (i.e., westward into the Merced River system).

Existing Water Resource Systems

The existing water resource systems in the County include irrigation water, drinking water, wastewater, and stormwater systems. These systems are owned and operated by irrigation and water districts, urban and rural water purveyors, and the County government. The locations of these water resource systems are shown in Figures ES-3 and ES-4. There are no irrigation or water districts in the Foothills and Mountains.

The service areas of existing irrigation and water districts cover approximately 294,300 acres (approximately 58 percent of the Valley Floor). Most of the remaining area (213,500 acres) of the Valley Floor is not within the service area of a water purveyor. The cities of Madera and Chowchilla are the largest urban water purveyors in the County, providing service to approximately 56,000 and 18,000 people, respectively.

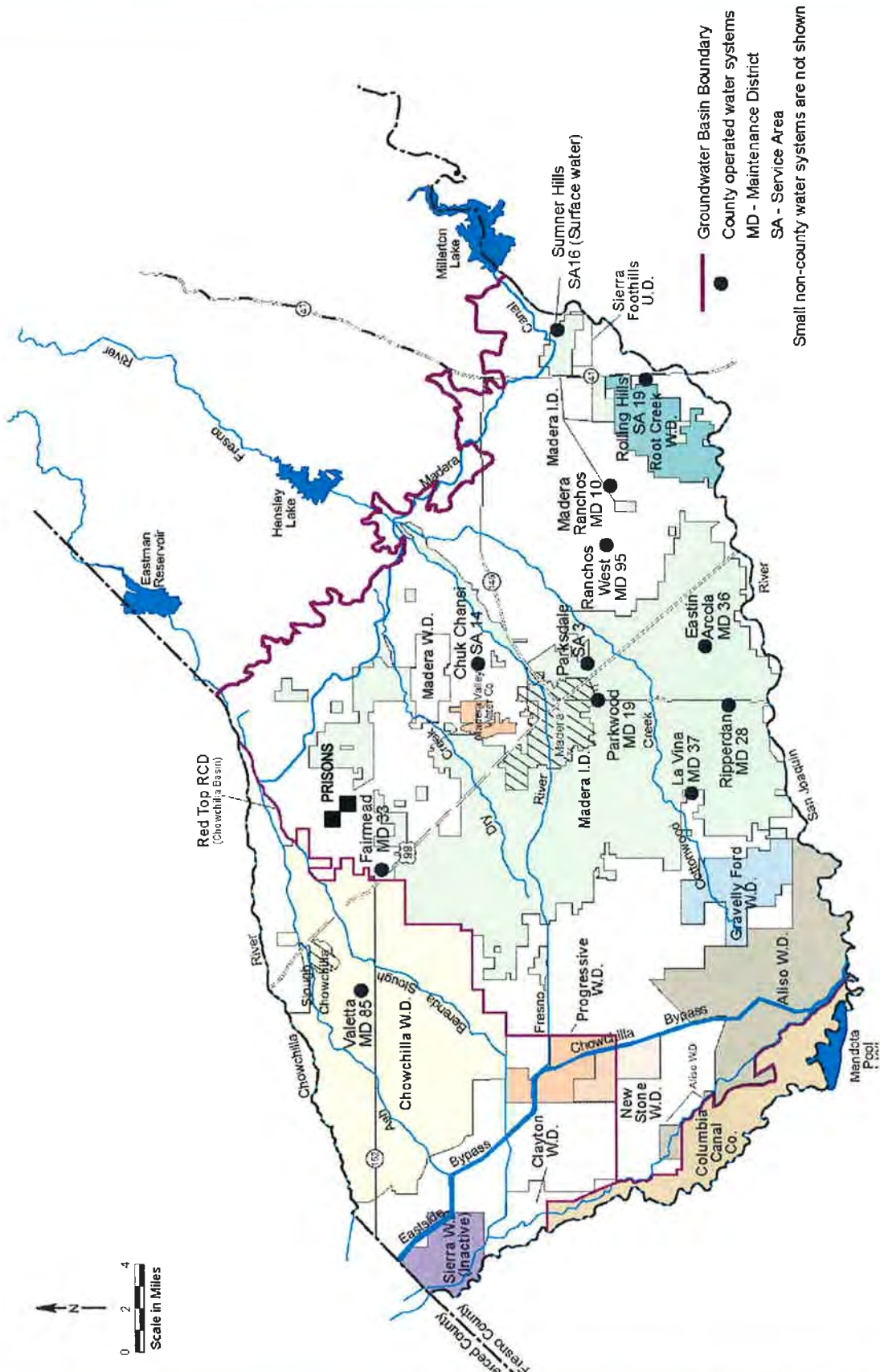
Madera County has 34 County Service Areas and Maintenance Districts that together operate 30 small water systems and 16 sewer systems. Fourteen of these special districts are located in the Valley Floor, and the remaining 20 special districts are in the Foothills and Mountains. MD-1 Hidden Lakes, Bass Lake (SA-2B and SA-2C), and SA-16 Sumner Hill have surface water treatment plants, with the remaining special districts relying solely on groundwater. The infrastructure in most of the County special districts is in need of repairs and improvements.

Most of the private water companies are located in the Foothills and Mountains with the largest being the Hillview Water Company. It has four separate water systems in Oakhurst, Coarsegold, Goldside, and Raymond.

The major wastewater treatment plants in the County are operated in the incorporated cities of Madera and Chowchilla and the community of Oakhurst. These wastewater systems have been recently or are planned to be upgraded, increasing the opportunities for use of recycled water. The cities of Madera and Chowchilla have adopted or are in the process of developing Urban Water Management Plans. Most of the irrigation and water districts have individual groundwater management plans. All of these agencies engage in some form of groundwater recharge and management.

Water Demand

Water in the County is used for meeting agricultural, urban, and rural water demands. Total water use in the County in 2006 was approximately 1.2 million acre-feet (MAF). Agricultural water use was 1.17 MAF in 2006, or approximately 97 percent of the total water use in the County. Urban



SOURCE: TODD ENGINEERS, 2002



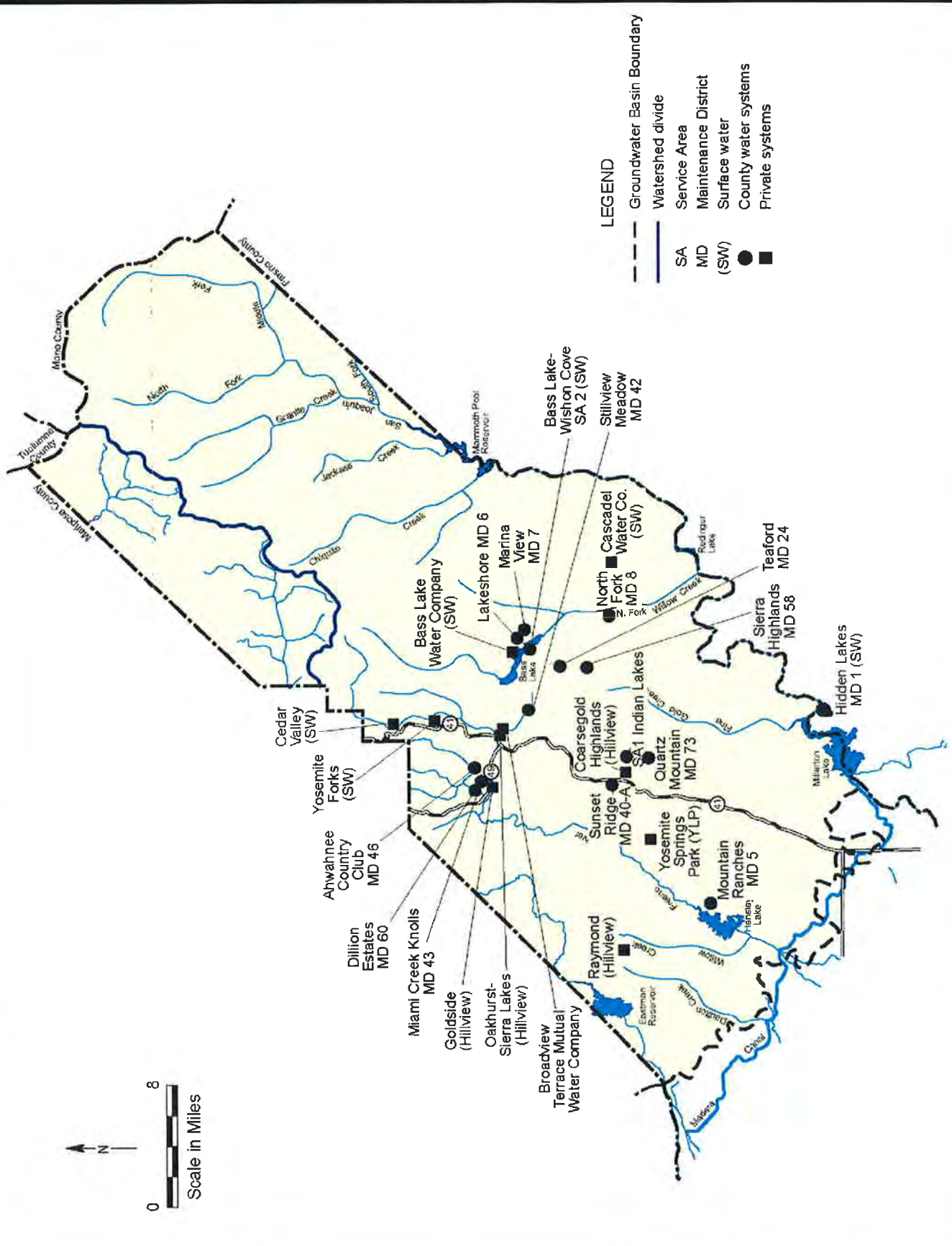
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VALLEY FLOOR WATER SYSTEM PROVIDERS

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FIGURE
ES-3



SOURCE: TODD ENGINEERS, 2002

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FOOTHILL / MOUNTAIN WATER PROVIDERS

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FIGURE
ES-4

and rural water use comprising all of the water use in the cities, unincorporated towns, and private residences was estimated to be 29,540 AF for 2006.

For the 2000 to 2006 period, water demand averaged 311 gallons per capita per day (gpcd) for the City of Chowchilla, 230 gpcd for the City of Madera, 168 gpcd for the unincorporated areas, and 191 gpcd for the County as a whole.

Based on the California Water Plan Update 2005, it is estimated that agricultural water use in the County will level off and be approximately 1.2 MAFY by 2030. It was estimated that urban and rural water use in the County will be approximately 91,100 AFY by 2030, making the total County water demand in 2030 approximately 1.3 MAFY. This is approximately 8 percent greater than the existing demand.

Water Supply

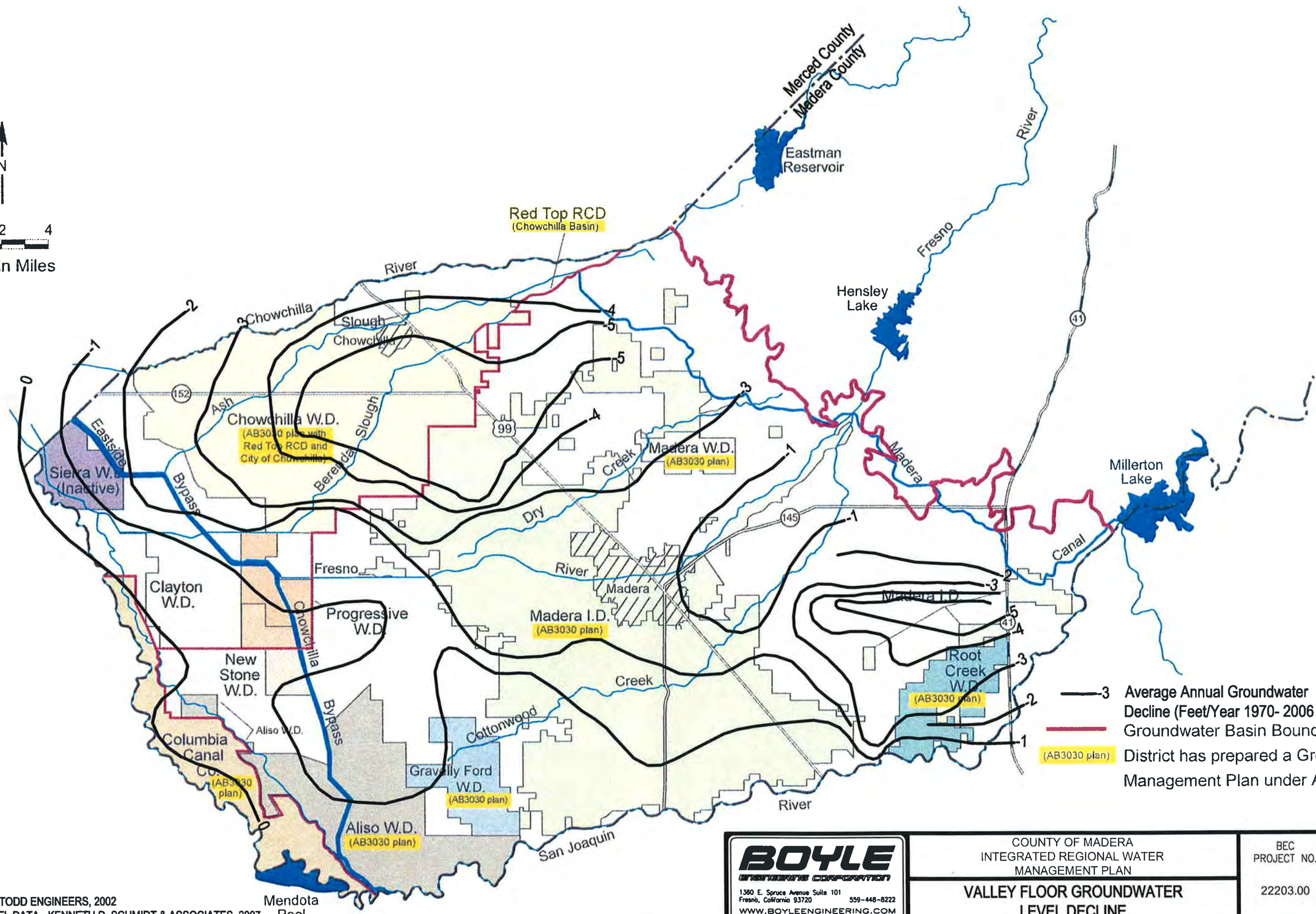
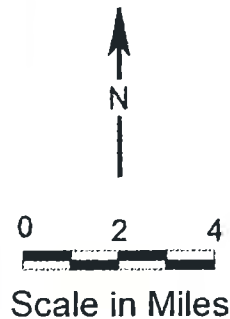
Groundwater provides almost the entire urban and rural water use and about 75 percent of the agricultural water use in the Valley Floor. The remaining water demand is met with surface water. Almost all of the water use in the Foothills and Mountains is from groundwater with only three small water treatment plants relying on surface water from the San Joaquin River and its tributaries.

Groundwater for the Valley Floor is pumped from the Madera, Chowchilla, and Delta-Mendota groundwater subbasins. Historically, the direction of groundwater flow in much of the Valley Floor was to the southwest, toward the valley trough (San Joaquin River downstream of Mendota). However, as groundwater pumping has increased, instead of flowing uniformly to the southwest, groundwater has been flowing away from the San Joaquin River to the northwest.

There has been virtually no water-level decline in recent decades near the San Joaquin River downstream of Mendota near the west edge of the Valley Floor area in Madera County. Water-level declines have averaged about 1 foot per year farther east, primarily in the area between the Eastside Bypass and the San Joaquin River and near the San Joaquin River upstream of Mendota. Rates of water-level decline generally increase with increasing distance from the Chowchilla River, the Fresno River, and the San Joaquin River. For example, near the Fresno River east of the City of Madera, the average rate of water-level decline has been less than 1 foot per year. In contrast, the greatest average water-level declines in the Madera area have exceeded 5 feet per year. These include areas east of the Santa Fe Railroad, such as Madera Ranchos, Rolling Hills, and nearby irrigated lands, that rely solely on groundwater. Another area with very large water-level declines is in the eastern part of Chowchilla Water District and to the east, where irrigated lands and the City of Chowchilla rely solely on groundwater. The average rate of water-level decline throughout the Valley Floor is shown on Figure ES-5.

Chowchilla Water District (CWD), Madera Irrigation District (MID), and the U.S. Bureau of Reclamation (USBR) are the major surface water rights holders on the Chowchilla and Fresno River systems, which are both riparian and appropriative in nature. CWD, MID, Gravelly Ford Water District (GFWD), and the County are Central Valley Project (CVP) water service contractors holding contracts for CVP water from the Friant Unit of the CVP. Columbia Canal Company (CCC) is a San Joaquin River Exchange Contractor and receives water under an exchange contract

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- Average Annual Groundwater Decline (Feet/Year 1970- 2006)
- Groundwater Basin Boundary
- District has prepared a Groundwater Management Plan under AB3030

SOURCE:
 BASE MAP - TODD ENGINEERS, 2002
 WATER LEVEL DATA - KENNETH D. SCHMIDT & ASSOCIATES, 2007

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 LEVEL DECLINE**

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FIGURE
ES-5

with USBR. Average annual surface water deliveries are estimated to be about 300,000 AFY (1996-2006), not including direct diversions from the San Joaquin River downstream of Friant Dam. Despite the surface water supply, the Valley Floor groundwater overdraft is approximately 100,000 AFY. The areas contributing to this overdraft are shown in Figure ES-6. Based on the water demand and supply analysis for 2030, it is anticipated that the overdraft in the Valley Floor will grow to about 155,000 AFY if no mitigation action is taken, potentially resulting in higher pumping costs, poorer water quality, land subsidence, and potential adjudication of the basin. The continued overdraft of the groundwater basins in the County is not sustainable.

Groundwater in the Foothills and Mountains is drawn from wells and springs in weathered materials and fractures in the hard rock. Recharge to the groundwater is derived from precipitation on the local watershed. Average precipitation is generally about 14 inches per year in the lowest foothill areas to more than 50 inches per year in the higher parts of the watersheds. In the areas evaluated, groundwater was moving from topographically high areas toward topographically low areas (stream channels), indicating that there was little or no recharge from stream channels in low topographic areas.

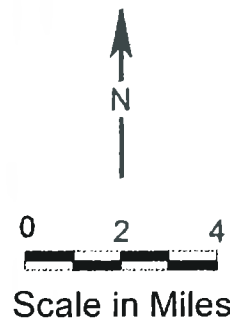
In areas of higher precipitation (Oakhurst, North Fork, and the topographically higher part of the Coarsegold area), groundwater recharge is adequate for existing uses. However, some problems have been encountered in parts of these areas due to well interference and groundwater quality issues. In areas of lower precipitation (Raymond-Hensley Lake and the lower part of the Coarsegold area), groundwater recharge is more limited, possibly requiring additional water supply from other sources to support future development.

Water Quality

Groundwater quality contaminants of concern in the Valley Floor include high salinity (TDS), nitrate, uranium, arsenic, methane gas, iron, manganese, slime production, and dibromochloropropane (DBCP) with the maximum contaminant level (MCL) exceeded in some areas. Despite the water quality issues noted above, most of the groundwater in the Valley Floor is of suitable quality for irrigation. Groundwater of suitable quality for public consumption has been demonstrated to be present in most of the area at specific depths.

Groundwater quality contaminants of concern in the Foothills and Mountains include manganese, iron, high salinity, hydrogen sulfide gas, uranium, nitrate, arsenic, and methylbutylethylene (MBTE) with the MCL being exceeded in some areas. Despite these problems, there are substantial amounts of good-quality groundwater in each of the areas evaluated in the Foothills and Mountains. Iron and manganese are commonly removed by treatment. Uranium treatment is being conducted on a well by the Bass Lake Water Company. If this treatment does not prove to be feasible, the need for a surface water system may be more pressing in the Bass Lake-Oakhurst area due to the presence of uranium.

Only the San Joaquin River system (including Willow Creek) is currently used for domestic water supply. The water quality in the river has historically been good. However, at lower elevations it has sufficient organic matter resulting in elevated disinfection byproducts (DBP), which have caused individual water systems to violate DBP MCLs.



CHOWCHILLA SUBBASIN

Red Top RCD
(Chowchilla Basin)

Merced County
Madera County

Eastman Reservoir

Hensley Lake

MADERA SUBBASIN

Millerton Lake

NORTHEAST
UNDISTRICTED AREA
30,000 AF/YR

CWD & MID
20,000 AF/YR

SOUTHEAST
AREA
22,000 AF/YR

WESTERLY
UNDISTRICTED AREA
15,000 AF/YR

CITY OF MADERA
MASTER WATER PLAN AREA
8,000 AF/YR

SOUTHWEST
AREA
4,000 AF/YR

- Groundwater Basin Boundary
- District has prepared a Groundwater Management Plan under AB3030
- 6,000 AF / YR Estimated Water Overdraft

DELTA-MENDOTA SUBBASIN

Mendota Pool

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COUNTY OF MADERA
INTEGRATED REGIONAL WATER
MANAGEMENT PLAN
**SUBAREAS AND OVERDRAFT
IN VALLEY FLOOR AREA**

BEC
PROJECT NO.
22203.00

FIGURE
ES-6

DMC: V:\Madera, County of\22203.00 IRWMP\CAD\FIGURES\Chapter 5\FIG ES-6.dwg USER: drodriguez
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SOURCE: TODD ENGINEERS, 2002

The greatest impact of failing septic systems is due to overland flow to surface water bodies. However, failing septic systems can also degrade local shallow groundwater. Untreated wastewater contains excessive nutrients that can harm native plant and fish populations. Strict adherence to existing regulations and development of policies to protect water quality is therefore necessary in the County.

Flood Control Planning

The Valley Floor has a long history of flooding, mainly associated with the Fresno and Chowchilla Rivers and their tributaries. Floodway obstructions, limited channel capacity, and poor levee maintenance are the main factors causing flooding. Natural obstructions to flood flow include vegetation growing in floodway areas. Other obstructions include roadways, bridges, and culverts among others.

DWR acknowledged in a white paper that California's Central Valley flood control system is deteriorating. Yet funding to maintain and upgrade flood protection infrastructure has sharply declined. Most project levees are maintained by local agencies such as reclamation and levee districts.

The Madera County Flood Control and Water Conservation Agency (FCWCA) was formed in 1969 by Madera County Flood Control Act 4525 to be responsible for flood control planning in the County and is responsible for the maintenance of approximately 75 miles of levees on the Fresno and Chowchilla River systems. However, FCWCA currently does not have sufficient staff and funding to adequately address flood control in the County.

Water Resources Management Opportunities

The Valley Floor's most critical water resources issues include groundwater overdraft and storm water flooding. This condition will deteriorate if no mitigation is implemented. Table ES-1 shows identified projects that will assist in reducing overdraft and help with flood protection. Major water supply augmentation projects for the Valley Floor include the Chowchilla Water District-Merced Irrigation District Intertie, Temperance Flat Dam and Reservoir, MID Water Enhancement Project (Madera Water Bank), Madera Lake Area Groundwater Storage Project, Madera Canal/Hidden Dam Pump Storage Project, and several other CWD and MID projects.

Water demand reduction measures that could be implemented in the County include agricultural, municipal, and industrial water conservation projects, including metering of all deliveries and wastewater reclamation projects. Flood control projects and programs that the County could implement or participate in include development of a countywide Storm Water Master Plan, City of Madera Downtown River Project, a comprehensive Multiagency Flood Control Program, and development of a countywide Emergency Response and Recovery Plan.

Recent evaluations of groundwater supply availability in the Foothills and Mountains indicate that groundwater conditions are not as dire as predicted when previous surface water studies were performed. However, some surface water supply investigations are needed to determine the best

Table ES-1. Potential Water Supply Augmentation & Overdraft Reduction Projects on the Valley Floor

Project Name	Implementation Agency(ies)	Potential Overdraft Reduction (AFY)	Project Status	Projected Completion Date	Lead Agencies for Environmental Compliance		Estimated Costs			Existing or Potential Funding Sources	Other Benefits	Implementation Issues/Comments	
					CEQA	NEPA	Project Cost (\$Million)	Annual O&M Costs (\$)	Basis Year				
					1. Water Enhancement Project (Madera Water Bank)	MID	20,000	Pilot testing project	2013 (earliest)				MID
2. Madera Canal/Hidden Dam Pump Storage Project	MID	7,000	Feasibility study and predesign reports complete	2010 (earliest)	MID	USACE	16.543	143,490	2005	MID			MID pursuing USACE authorization.
3. Madera Lake Regulating and Recharge Project	MID	up to 10,000	Feasibility study complete	Sep 2006	MID		0.155	5,000	2004	MID, DWR, USBR			MID may pursue installation of a permanent water elevation control structure in the Fresno River and additional recharge basins on the south side of the Fresno River. Also, the feasibility of increasing the inlet canal capacity needs investigation.
4. Lateral 32.2 Regulating and Recharge Reservoir	MID	580	Not currently funded		MID		0.310	5,500	2004	MID, DWR, USBR			2004 USBR Challenge Grant application denied. MID researching opportunities to have basin excavated by others.
5. Merced Irrigation District to CWD Water Transfer	CWD / Merced ID	7,500 - 15,000	Feasibility study complete		CWD		3.423 - 4.584		2000				Further evaluation of alternatives required. Awaiting funding.
6. District-Wide SCADA Improvement Project	CWD / Merced ID	7,000 - 14,000	Design phase		CWD		0.730		2006	CWD, DWR, USBR	Reduced O&M		\$300,000 USBR Challenge Grant received.
7. Root Creek Surface Water Project	RCWD	4,190	Agreements in place		RCWD		5.810	272,000	2003	RCWD, DWR			Permitting and construction of facilities required for implementation of project.
8. WWTP Effluent Reuse (Agricultural Reclamation)	City of Madera / MID	up to 9,600	WWTP expansion underway	mid 2008	City of Madera					City of Madera and MID			Deliveries of groundwater pumped from under the WWTP percolation ponds to MID may begin in 2008 and increase to a maximum of 9,600 AFY by 2030.
9. WWTP Effluent Reuse (Agricultural Reclamation)	Chowchilla/CWD	up to 2,000	City planning new WWTP		City of Chowchilla					City of Chowchilla			Current 1.8 MGD WWTP to be used for industrial. wastewater when new plant online.
10. Residential Water Metering	City of Madera	3,500 to 6,600	Currently no program	Assumed 2015 in UWMP	City of Madera		6.0 - 9.5		2007	City of Madera			All new single-family residences (SFR) have had meters installed since 1992. Currently all SFR are billed on a flat rate.
11. Residential Water Metering	City of Chowchilla	1,300 to 1,600	Currently no program	Assumed implemented by 2015	City of Chowchilla		0.7 - 1.1		2007	City of Chowchilla			All SFR have had meters installed since 1992. Currently 950 unmetered. Currently all SFR are billed on a flat rate.
12. Ultra-Low Flush Toilet Replacement Program	City of Madera	375	Currently no program	Assumed implemented by 2015	City of Madera		7 - 8		2006	City of Madera			Water savings based on AWWARF study and costs based on City of Fresno contracts for installing meters.
13. Ultra-Low Flush Toilet Replacement Program	City of Chowchilla	75-100	Currently no program	Assumed implemented by 2015	City of Chowchilla		1.2 - 1.8		2006	City of Chowchilla			Water savings based on AWWARF study and costs based on City of Fresno contracts for installing meters.
14. San Joaquin River Storage - Temperance Flat	USBR	200,000 ¹	Requires State legislation			USBR					Flood Control		County needs to support authorization legislation and obtain its share of the project yield.
15. Expansion of CWD Service Area	CWD/USBR				CWD	USBR							USBR processing application to add 10,000 acres.

Table ES-1. Potential Water Supply Augmentation & Overdraft Reduction Projects on the Valley Floor

Project Name	Implementation Agency(ies)	Potential Overtdraft Reduction (AFY)	Project Status	Projected Completion Date	Lead Agencies for Environmental Compliance		Estimated Costs			Existing or Potential Funding Sources	Other Benefits	Implementation Issues/Comments
					CEQA	NEPA	Project Cost (\$Million)	Annual O&M Costs (\$)	Basis Year			
					16. Expansion of MID Service Area	MID/USBR						
17. Regulating / Recharge Basins in CWD	CWD				CWD							
a. Road 16 and Avenue 20 Basin	CWD				CWD							Basin constructed. Pumpback facility required.
b. Berenda Canal/Greenhills Basin Connection	CWD				CWD							Feasibility study required.
c. Joint Use of City of Chowchilla Basins	CWD/City of Chowchilla				CWD							Feasibility study required.
d. Water Supply Development Study	CWD	4,000 to 10,000	Awaiting authorization									Study to evaluate the potential of developing new supply for future farming and development.
18. Improved Water Level Control Structures in CWD	CWD				CWD							Feasibility study required.
19. Improved Water Measurement Structures in CWD	CWD				CWD							Feasibility study required.
20. Surface Water Storage Reservoirs in CWD	CWD/USBR				CWD	USBR						Feasibility study of sites near the Madera Canal required.
21. Replacement of Cast-In-Place Pipe	CWD				CWD						Reduced O&M	CWD currently replacing 1/2 mile per year.
22. Replacement of Discharge Valve at Friant Dam	USBR				FWA	USBR						Feasibility study required.
23. Madera Lake/Fresno River Diversion Structure	MID				MID							Feasibility study required.
24. City of Madera/MID Storm water Recharge Project	City of Madera/MID				MID/City							City and MID need to work cooperatively to implement existing agreement.
25. City of Madera Stormwater Retention Basin Project	City of Madera				City							Further development of project description required.
26. Replacement of Low Flow Gate at Hidden Dam	USACE/MID				MID	USACE						May be done as part of Pump/Storage Project.
27. Fresno River to Madera Canal Diversion Structure	MID				MID	USBR						Feasibility study required.
28. City of Madera Airport Recharge Project	City of Madera/MID				MID							Feasibility study required.
29. Arundo Removal Project	County/CWD/MID		Developing project details		County						Flood Control	Limited work to begin in 2007. Funding required.
30. Retirement of Irrigated Agricultural Lands			Conceptual									Concept stage. Further development of potential program required.
31. Root Creek Flood Control and Water Supply	County/MID/RCWD		Conceptual								Flood Control	Feasibility study required.
32. Downtown Fresno River Project	County/MID/City of Madera		Conceptual									County and City of Madera seeking grant funds for feasibility study.

¹ Estimated yield of project. Valley-wide overdraft benefits. Benefit to Madera County depends on allocation of new yield.

manner to augment groundwater in some areas of the Foothills and Mountains. These could include water supply studies for the Oakhurst-Bass Lake, lower Coarsegold, and Raymond-Hensley Lake areas. Research and anecdotal evidence indicate that the native evapotranspiration can be significantly reduced through various methods of vegetative treatment. This may result in additional runoff in the higher mountain communities and potentially increase surface water supplies, but additional research and study are needed to demonstrate the water supply benefits of vegetative management.

Water quality improvement in the County can be accomplished by implementing existing groundwater management plan water quality protection elements, enforcing existing policies and ordinances and enacting new ones as necessary, sewerage unsewered areas, and using groundwater wellhead treatment, where necessary.

Other water management measures that could be considered throughout the County include implementation of land use policies regarding water availability, demonstration of sustainable water supply for new large development, implementation of additional water management measures to improve water use efficiency, and County water and wastewater system infrastructure improvements. The specifics of such land use policies, such as the size of development to which any new policy would apply, would be established through the process of policy development and adoption.

Recommendations

The following summary of the IRWMP recommendations are presented by study area. It should be noted that many of these recommendations may apply to other study areas and many have countywide benefits as noted in the recommendation. A more complete description of the recommendations is included in Section 9 of the Plan.

Foothills and Mountains

- Requirements for enhanced water supply evaluations and pump testing of new public supply wells should be developed.
- A complete hydrogeologic evaluation should be made by a certified hydrogeologist where it is proposed to use groundwater to meet the water demand of a new large development. The definition of *large development* will be developed as part of the new ordinance process, if initiated.
- Well spacing criteria should be developed to govern the distance between new public supply wells and existing wells in densely populated areas to help prevent well interference problems. Well spacing criteria should also consider spacing from septic systems and property lines.

- The County should develop a program to identify and protect the groundwater recharge areas in the Foothills and Mountains area.
- The Oakhurst WWTP should proceed with plans to construct a pipeline crossing of the Fresno River to enable the development of additional sprayfields on the north side of the river and to eventually take water to the Sierra Meadows golf course area for irrigation use on the golf course and surrounding landscaped areas.
- County Ordinance 17.48.020 allows for individual septic tanks on each lot of a subdivision on land above the 500-foot elevation. The County should review this ordinance, specifically the size and number of lots allowed to have individual septic systems in a subdivision with the goal of protecting groundwater quality.
- There are several unsewered areas in the County. To limit the impact of failing septic systems, it is recommended that a feasibility study be conducted for sewerage of these areas. It is also recommended that new developments install centralized treatment and disposal systems instead of private septic tanks where technically and economically feasible.
- The hydrogeologic investigations of the lower Coarsegold and Raymond-Hensley Lake areas conclude that the recharge in these areas is very limited and that further large-scale dense development may require a supplemental water supply to augment the available groundwater. It is recommended that feasibility studies of developing surface water supplies for treatment and delivery for domestic use in these areas be performed.
- Prior to implementation of specific vegetation management projects designed to increase water supply within Madera County, it is recommended that the legal issues, such as the right to any verified increase in water supply due to the project, be evaluated. If it is determined that there is a legal mechanism for acquiring the right to the water produced by the project, feasibility studies, including pilot tests, are needed.

Valley Floor

The major water supply issue in the Valley Floor is the continuing overdraft of the groundwater basins. The following recommendations are intended to help alleviate this problem through the reduction of groundwater pumping or by increasing available water supplies. Many of the recommended projects and programs are applicable to the Foothills and Mountains and may provide additional water supply to the Foothills and Mountains through transfer and exchange programs.

The recommendations describe projects, programs, and policies that the County may consider implementing or participating in through partnerships or agreements with other agencies in the County. Many of the identified projects will be developed and operated by other agencies but will require County support for implementation. The following list of recommendations addresses only the major projects identified that are in some stage of development or have the potential to significantly contribute to overdraft reduction in the near term. A complete list and further description of all identified projects, programs, and policies is presented in Chapter 8 of this Plan.

- As a CVP contractor, the County must engage in the process and support the other CVP contractors' efforts to protect CVP allocations from further reduction due to San Joaquin River restoration efforts. It is estimated that 15 to 20 percent of CVP water supplies could be lost. Provisions to make up for any water lost to river restoration efforts must be a part of any plan. It is critical that the County be actively engaged to protect this vital portion of the County's water supply.
- The County should evaluate participation in water banking as a potential means of augmenting water supply within the County. A number of water bank projects may be presented following acceptance of this Plan.
- As a CVP contractor, the County is eligible to receive Section 215 water (water released from Friant Dam for flood control purposes). The County should pursue these opportunities and should develop agreements with MID, CWD and the USBR to use the Madera Canal to convey Section 215 water to County facilities or joint use facilities that may be developed as part of a multiagency project.
- CWD performed a study to evaluate the feasibility and estimate the cost for a water conveyance system to deliver up to 15,000 AFY of irrigation water from the Merced Irrigation District to CWD. It is recommended that CWD pursue development and implementation of the project and that the County cooperate with and assist CWD in expediting the project.
- USBR performed an investigation of the storage opportunities on the San Joaquin River. As a result of this comprehensive study, Temperance Flat Dam and Reservoir, with two potential locations and an offstream alternative adjacent to Millerton Lake, are being considered. The new Temperance Flat Reservoir could hold up to 1.3 MAF of water and supply up to 200,000 AF of water (new yield) per year.

Madera County, as an "area of origin," and a CVP contractor must evaluate the benefits and costs of water supply from this facility, determine how this water source will integrate with the other surface and groundwater sources available to the County, and develop a well-founded plan to acquire a portion of this new water supply to help relieve overdraft and provide high-quality water for use within the County. Water from this project could be stored in the County's share of the Madera Water Bank and/or through transfers and exchanges be used in most parts of the County, including the Foothills and Mountains area.

- MID has determined that the Madera Canal/Hidden Dam Pump Storage Project is feasible and the potential benefits warrant continued development of the project. The project has the potential to provide up to 6,000 AFY (average) of additional water supply for use by MID as a redirection of an existing water supply. MID is currently seeking authorization from the USACE and will have to seek funding for the project. There are potential partnering opportunities for the County and/or other water agencies in the County that should be pursued.

- The Madera Lake Area Groundwater Storage Study indicated that the recharge potential of Madera Lake is approximately 10,000 AFY. The study also indicated that the area south of the Fresno River adjacent to Madera Lake is favorable for the construction of additional recharge basins. This project, in conjunction with the acquisition of surface water supplies by the County and the development of the Madera Water Bank, may create opportunities to store, transfer, and exchange water with MID that would allow for delivery of other surface waters in the County at locations where it is needed for future development. The County and City of Madera should discuss with MID the possibilities of participating in the development of the project.
- The Madera Canal is the key facility for conveying San Joaquin River water into the County for current use. Its use would be required for many of the water augmentation projects identified. It is also the primary facility that allows water purchased or brought in from outside the County to be conveyed into the County through transfers and exchanges. Increasing the canal capacity may be required in the future and would have countywide benefits, including the Foothills and Mountains. It is recommended that a feasibility study for increasing the capacity of the canal be conducted and that funding for the study be obtained from all future beneficiaries.
- As part of the City of Madera Wastewater Treatment Plant Expansion project, the City proposes that a system of extraction wells be constructed in the area of the percolation ponds to pump groundwater from under the ponds to prevent mounding and elevated concentrations of nitrates and other contaminants in the underlying groundwater. The City has entered into an agreement with MID to pump up to 9,600 AFY of the groundwater into the MID distribution system for irrigation use. The City should discuss with MID the possibility of exchanging this groundwater for surface water delivered upgradient of the City for use in recharging the groundwater basin.

This type of project presents the opportunity for the City of Madera, MID and possibly the County to participate in developing joint use recharge facilities. This and other opportunities should be pursued by the County and other water agencies in the County. The County should take the lead in initiating a multiagency-funded feasibility study of potential joint use recharge facilities throughout the County. In addition, the study would evaluate the opportunities for these basins to also serve as flood control basins.

- The major water systems in the Valley Floor do not meter and charge for water on a volumetric basis. These systems include the cities of Madera and Chowchilla and the County Service Areas and Maintenance Districts. Data shows that water use is reduced by 15 to 25 percent when meters are installed and water is billed on a volumetric basis. Potential water savings and reduction in groundwater pumping could range from 6,000 to 9,000 AFY. It is recommended that a jointly funded study be initiated that would determine the cost, recommend a process for meter installation, evaluate alternative water rate schedules, and identify potential funding sources.
- The County should develop a program to identify and properly abandon wells no longer in use to prevent the cross-contamination of aquifers. The County's well standards (Title 13,

Section 13.52) should outline the criteria for determining whether a well should be abandoned and the process for abandonment.

- The County should investigate the following policies as to the legal and institutional feasibility and for possible adoption. The size of development to which any new policy would apply would be established during the development and adoption process for the policy.
 - Setting limitations on new agricultural development if water supply is not sufficient to meet demand and/or requiring annexation into a water or irrigation district as a prerequisite. Limitations could be in the form of limiting groundwater pumping on a per-acre limit and could be applied only to areas with severe overdraft problems as defined in the policy or ordinance.
 - Metering of water produced by groundwater wells.
 - Groundwater pump tax or land-based assessment to fund water supply projects. Funds raised through these mechanisms should not go into the general fund and should be reserved for implementation of engineered projects and not further studies. A tax or assessment may be subject to the constraints of Propositions 13 and 218.
 - Requiring all new large development to provide the approving agency a detailed plan to balance the development's water supply and not rely on mining or overdraft of the basin to meet its demands.
 - Requiring new large development to include facilities for the reuse of wastewater, including dual plumbing (nonpotable/recycled and potable water).
- It was estimated by County staff that it would cost approximately \$90 million to complete repairs and make required improvements on all County-operated water and sewer systems. It is recommended that funds be sought from all available sources to repair and improve these systems to improve water supply reliability and quality for the special district customers. It is also recommended that rate structures be implemented that will collect adequate funds to make the districts self-sufficient. The County should also look at combining districts where possible.
- The County was put on notice by the Central Valley Flood Protection Board (formerly the Reclamation Board) that deficiencies exist on the Chowchilla River and Ash and Berenda Sloughs, and the County has recently been notified by the Board that the County's submitted corrective action plan was acceptable. In addition, the County has requested an extension of time to complete the corrective actions but has not received an answer to the request. If corrections are not made and a reinspection scheduled by the deadline, the project will be considered inactive and will not be eligible for PL84-99 rehabilitation assistance.
 - The County should proceed immediately with all corrective actions as outlined in the action plan.

- A group of representatives should be formed from the County, cities of Madera and Chowchilla, MID, and CWD to discuss development of a multiagency project to construct and operate storm water detention / groundwater recharge basins throughout the Valley Floor with the objectives of reducing flood problems and recharging the groundwater basin.
- An Emergency Response and Recovery Plan should be developed for the County, consistent with the National Incident Management System.
- Formed in 1969 by Madera County Flood Control Act 4525, FCWCA has many authorized functions and authorities, including the ability to tax and issue certain bonds for project work as well as many enforcement powers. However, FCWCA has no assigned staff and a very limited budget even though it has responsibility for maintenance of approximately 75 miles of levees on the Fresno and Chowchilla River systems. It is recommended that the County provide adequate staff and funding to develop and implement a well-coordinated flood control program for the entire County. To accomplish this, a detailed study of the functions, programs and projects for which FCWCA would be responsible, along with a determination of the required staffing and funding levels, is needed.
- It is recommended that the County implement the proposed countywide groundwater monitoring program as presented in Appendix F. The program is designed to continue the data collection started as part of this project and to fill in the gaps where sufficient data is not currently collected. This program is vital to monitoring groundwater conditions throughout the County and to provide data for future decisions regarding development and protection of the County's water resources.

Chapter 1

Introduction

1.1 Purpose of Plan

This report presents the Integrated Regional Water Management Plan (IRWMP or Plan) of the County of Madera (County). It is the work product of the AB 303 and Proposition 50 Study Grants received from the Department of Water Resources (DWR). Completion of a sound plan will assist the County in meeting the goals and objectives identified in the AB 3030 Groundwater Management Plan for Madera County (Todd Engineers, 2002a) and will allow the County to better manage its water resources for the benefit of its residents, environment, and the State of California. Completion of the Plan will also make the County and participating agencies eligible for Proposition 84 grants to implement projects and programs identified in the IRWMP. This Plan has been developed based on the water quantity and quality data gathered and through a collaborative process involving the various stakeholders in the County.

The County is located in the geographic center of California in the Central San Joaquin Valley as shown in Figure 1-1. It covers approximately 2,147 square miles (1.4 million acres). It is rich with natural resources including rich valley soils that support a vibrant agricultural economy. It also has a rapidly growing population, an expanding economy, low crime, and educational excellence.

The County has historically relied heavily on groundwater to support its domestic water needs and a large portion of the agricultural water needs. This continued reliance has reduced usable groundwater supplies. DWR has identified the Madera and Chowchilla basins to be in a critical condition of overdraft. This situation is exacerbated by current water use and flood control practices in the County. With the increased pace of urban development in the County, the overdraft problem will worsen over time if not addressed. Consequently, there is a need to take comprehensive regional measures to ensure water supply reliability and quality. Flood protection in the County is also an issue that needs to be addressed. Subsequent sections of this Plan document the collective approach of the County and its stakeholders to current and future water management in the County. For planning purposes the study timeframe is through 2030.

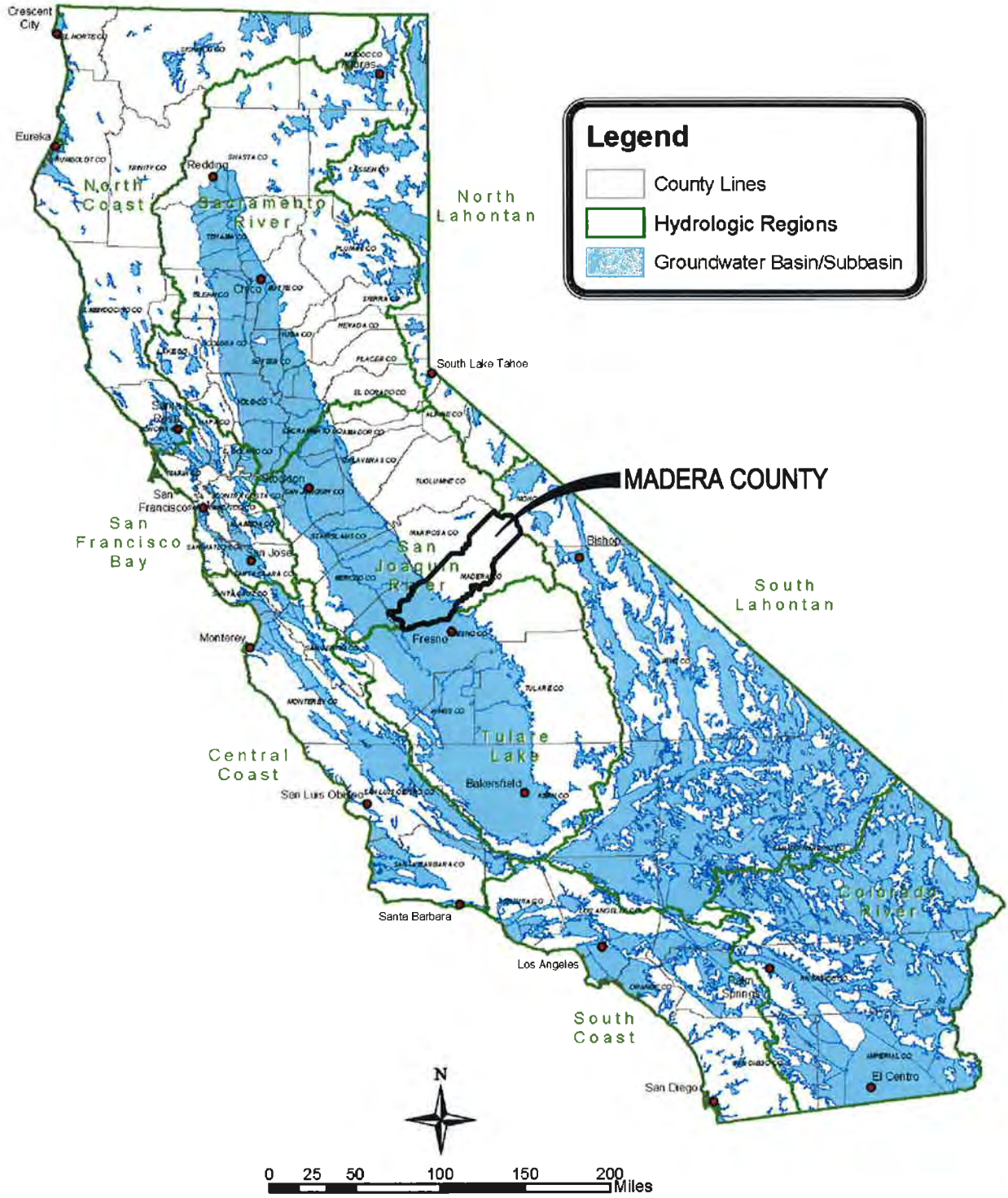
1.2 Regional Goals

For planning purposes, the County has been divided into two subareas in recognition of the hydrogeologic differences in the County. These are: 1) Valley Floor and 2) Foothills and Mountains. Chapter 2 describes these study areas in more detail. The goals of this Plan, as determined by the County, have been developed for each of the two subareas.

The specific goals for the Valley Floor are to enable the County to:

- Substantially reduce or eliminate the current groundwater overdraft through improved management of existing water supplies and development of additional water supplies.

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COUNTY OF MADERA
 INTEGRATED REGIONAL WATER
 MANAGEMENT PLAN
 COUNTY LOCATION MAP

BEC
 PROJECT NO.
 22203.00

FIGURE
 1-1

- Develop processes to better manage groundwater pumping.
- Incorporate flood protection into the water management strategy.
- Maintain and/or improve groundwater quality.
- Develop a groundwater monitoring program.

The Foothills and Mountains goals are to enable the County to:

- Create realistic, practical, implementable, and enforceable policies governing groundwater management to sustain the supply.
- Assess the feasibility of surface water supply development.
- Assess the potential for conservation, wastewater reuse/recycling, and watershed management.
- Create realistic land development policies and practices.
- Develop and implement a groundwater monitoring program.

1.3 Plan Scope

The scope of work to develop this Plan included the following tasks:

- Identification of alternatives to improve water supply through water resource management optimization in the County.
- Identification of potential new water supply sources.
- Development of alternatives to protect and improve water quality in the County.
- Review of the County's flood control program and development of recommendations to be implemented by the Madera County Flood Control and Water Conservation Agency (Madera County FCWCA).
- Planning process, public education, and administration.

The objectives associated with each task are outlined below.

1.3.1 Water Resource Management Optimization

The specific objectives of this task are to:

- Determine the adequacy of existing water supplies, given current levels of economic activity and development.
- Maximize the use of existing water supplies.
- Explore groundwater and surface water conjunctive use opportunities.
- Maximize groundwater recharge.
- Contribute to a Water Management Plan that, while accounting for regional differences, is consistent and equitably deals with the issue of distributing a scarce resource.

1.3.2 Evaluating and Increasing Water Supplies

The specific objectives of this task are to:

- Assess viable alternatives for obtaining and acquiring new sources of water for Madera County.
- Recognize the hydrogeologic, economic, and demographic differences between the Valley Floor and Foothills and Mountains regions of Madera County.
- Create a plan for water supply enhancement in parts of the County where needed.

1.3.3 Water Quality Protection and Improvement

The specific objective of this task is to identify feasible methods of using management, infrastructure, monitoring, and technology to protect and improve surface water and groundwater quality in the County.

1.3.4 Flood Control Planning

The specific objective of this task is to provide the information necessary for the County to create a comprehensive flood control program for flood prone areas within the County.

1.3.5 Planning Process, Public Education and Administration

The specific objectives of this task are to:

- Create public awareness of and input to the topics and issues being addressed by this study.
- Promote public discussion of the issues and recommendations resulting from this study.
- Develop a Madera County IRWMP that reflects the geographic, economic, and demographic diversity of Madera County.

- Provide consistent water management policies and practices that can ultimately be implemented by Madera County.
- Comply with reporting and payment requirements that meet the County's obligations to the grantee and contractors.
- Assist Madera County in creating an IRWMP that is consistent with current and emerging California water law and IRWMP requirements.

1.4 Regional Planning Process

1.4.1 AB 303 and Proposition 50 Study Grants

The County received an AB 303 grant and a Proposition 50 grant in 2006. The AB 303 grant was for groundwater management planning in the entire County. The Proposition 50 grant covered water management planning for the foothill and mountain areas in the eastern part of the County. Because the study areas and scopes of work of the two grants overlap, the County requested and obtained approval from DWR to combine the management and work product of the two grants for greater efficiency. These grants enabled the development of this IRWMP for the entire County.

1.4.2 IRWMP's Relationship to Existing Water Management Plans

The groundwater management plans and reports listed in Table 1-1 were relied upon to provide some of the background for understanding the historical water resources issues in the County. The data in these documents were reviewed and supplemented by more current data collected by the consulting team for this Plan.

The updated information on water management in the County contained in this Plan will help to formulate the General Plan elements dealing with water supply and flood protection. It will also help in updating the various water management plans in the County.

1.4.3 Consulting Team

The County selected a multidisciplinary consulting team to create this Plan comprised of Boyle Engineering Corporation (Boyle); Kenneth D. Schmidt and Associates (KDSA); and Cota, Duncan & Cole.

Boyle was the prime consultant who coordinated the activities of other subconsultants and provided water resources engineering. The hydrogeologist selected by the County, KDSA, initiated and performed the hydrogeology work under the AB 303 grant. This work included preliminary groundwater investigations in the North Fork, Coarsegold, and Raymond-Hensley Lake areas. An earlier DWR AB303 grant was used by KDSA in 2005 to conduct groundwater investigations in the Oakhurst area. Cota, Duncan & Cole evaluated the legal issues associated with development of the Plan.

Table 1-1. Summary of Groundwater Management Plans and Reports Used

Document Title and Author	Document Date
City of Madera 2005 Urban Water Management Plan, Boyle Engineering Corporation	December/February 2007
AB 3030 Groundwater Management Plan for Madera County, Todd Engineers	January 2002
Groundwater Conditions in Eastern Madera County Technical Memorandum, Todd Engineers	March 2002
AB 3030 Groundwater Management Plan for Madera Irrigation District, Boyle Engineering Corporation	May 1999
Groundwater Management Study for the Chowchilla Water District, Fugro West, Inc.	June 2006
Groundwater Conditions in the Oakhurst Basin (AB 303 Study), Kenneth D. Schmidt and Associates	November 2005
AB 303 Groundwater Management Plan for Root Creek Water District Summary Report, Provost & Pritchard Engineering Group	May 2003
AB 3030 Groundwater Management Plan for Root Creek Water District, Provost & Pritchard Engineering Group	October 1997
AB 3030 Groundwater Management Plan for Chowchilla Water District – Red Top RCD Joint Powers Authority, ANON	1997
In-Lieu Groundwater Recharge Facilities Feasibility Study for Root Creek Water District, Provost & Pritchard Engineering Group	April 2003
Phase 1A Basin Assessment Report for Chowchilla Groundwater Basin, Water Resources & Information Management Engineering, Inc.	April 2002
Basin Assessment Report (Phase IB) For Chowchilla Groundwater Basin, Water Resources & Information Management Engineering, Inc.	May 2002
San Joaquin River Exchange Contractors - Groundwater Management Plan	1997

1.4.4 Stakeholder Participation

Participation by the public and other County stakeholders was important to the development of this Plan. The comments, recommendations, support, and endorsement of the local communities for the projects, programs, and policies developed as part of this Plan will facilitate implementation by the County.

Advisory committees were formed to assist in the deliberation of issues addressed in this Plan. The Advisory Committees comprised over 80 individuals representing community organizations, municipalities, irrigation and water districts, and nondistricted areas. This outreach was designed to elicit input from the local communities such that the Plan will be afforded their local knowledge and address their concerns. Details on the Advisory Committees and the public participation are summarized as follows:

1.4.4.1 Foothills and Mountains Advisory Committees

Four Advisory Committees were formed to represent the community study areas in the Foothills and Mountains of the County. The four Advisory Committees represented the communities of Oakhurst, North Fork, Coarsegold, and Raymond. Due to the commonality of certain issues, joint advisory committee meetings were occasionally held. Approximately 17 advisory committee meetings were held with the Foothills and Mountains committees to discuss Plan development. In addition, numerous meetings were previously held during the Oakhurst hydrogeologic evaluation.

1.4.4.2 Valley Floor Advisory Committee

One committee represented the Valley Floor and held approximately ten committee meetings. The primary focus of the Valley Floor advisory committee was to develop water management strategies that will help alleviate the overdraft in the Valley Floor. There was a particular focus on the nondistricted areas on the Valley Floor, where the estimated overdraft is the most severe because of an absence of surface water supplies and groundwater is the sole source of water.

1.4.4.3 Public Review of Draft Plan

A draft of the Plan was made available for public review and comment. A copy of the draft Plan was made available at several locations throughout the County and was also available on a project website (www.maderawater.com), which was also accessible through a link on the County's website. The purpose of this exercise was for organizations, agencies, and individuals to provide comments and input to this Plan for consideration prior to its presentation to the Board of Supervisors for acceptance. In addition, three public meetings were held to present the draft Plan and to receive public comments on the draft Plan. Written comments were also accepted by the County. Copies of all written comments and responses to the comments and questions are included in Appendix G.

1.4.4.4 Plan Acceptance and Updates

It is the intent of the County that the Plan be a "living document" that will be updated and revised as conditions change or additional data and information is made available. The Plan is intended to provide guidance to the County in dealing with water resource issues now and in the future. The Madera County Water Advisory Commission will review the Plan every 6 months, or more frequently if necessary, and make recommendations to the Board of Supervisors to ensure the Plan is kept current and modified as required due to changing conditions, new information or requirements, or changes in law.

In addition, DWR is currently developing guidelines for Integrated Regional Water Management Plans that will not be adopted and made available to the public until after acceptance of this Plan by the Board of Supervisors. The County intends to apply for additional funding to update this Plan to meet the future guidelines and criteria for development of Integrated Regional Water Management Plans.

1.5 Abbreviations

Many abbreviations were used in this Plan with the major ones noted below.

AF	acre-feet
AFY	acre-feet per year
AWD	Aliso Water District
BLWC	Bass Lake Water Company
CCC	Columbia Canal Company
CDPH	California Department of Public Health (formerly California Department of Health Services)
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CPUC	California Public Utilities Commission
CRCD	Coarsegold Resource Conservation District
CVP	Central Valley Project
CWD	Chowchilla Water District
DBCP	dibromochloropropane
DBP	disinfection byproducts
DFG	California Department of Fish and Game
DOF	California Department of Finance
DWR	Department of Water Resources (California)
EIR	environmental impact report
EMCFSC	Eastern Madera County Fire Safe Council
FCWCA	Flood Control and Water Conservation Agency (Madera County)
FEMA	Federal Emergency Management Agency
GFWD	Gravelly Ford Water District
GIS	geographic information system
gpcd	gallons per capita per day
gpd	gallons per day
gpd/ft	gallons per day per foot
gpm	gallons per minute
gpm/ft	gallons per minute per foot
GPS	global positioning system
HAA5	five haloacetic acids
HPC	heterotrophic plate count
IRWMP	Integrated Regional Water Management Plan
JPA	joint powers agreement
KDSA	Kenneth D. Schmidt and Associates
MAF	million acre-feet
MAFY	million acre-feet per year
MCL	maximum contaminant level
MG	million gallons

MGD	million gallons per day
MID	Madera Irrigation District
MWD	Madera Water District
NEPA	National Environmental Policy Act
Plan	Integrated Regional Water Management Plan
RCWD	Root Creek Water District
TDS	total dissolved solids
TOC	total organic carbon
TTHM	total trihalomethanes
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USFS	U.S. Forest Service
WTP	water treatment plant
WWTP	wastewater treatment plant

1.6 Report Organization

Following the introductory chapter, this Plan includes the following chapters:

Chapter 2. Description of Study Area: Provides background information on the study area by describing the subdivision of the study area, population, topography, land use, and watershed areas.

Chapter 3. Existing Water Resources Systems: Provides background information on the existing water supply, wastewater, and flood control systems in the County.

Chapter 4. Water Demand: Presents historical and projected water demands which correspond to the growth projections in the County.

Chapter 5. Water Supply: Describes sources of water supply, including groundwater and surface water, and provides a comparison of water supply and demand in the County.

Chapter 6. Water Quality: Describes existing water quality issues in the County including groundwater quality problem areas, surface water quality, chemicals of concern, and the impact of failing septic systems as well as County policies and ordinances dealing with water quality.

Chapter 7. Flood Control Planning: Describes current flood control programs affecting the County, delineates flood problem areas, and discusses potential flood control measures.

Chapter 8. Water Resources Management Opportunities: Describes management alternatives in terms of projects, programs, and policies that appear viable to address the water resources problems in the County.

Chapter 9. Conclusions and Recommendations: Presents the conclusions of the study and details recommendations based on the preceding chapters and interactions with the County, stakeholders, and DWR.

Chapter 2

Description of Study Area

This chapter provides the basic background information that is necessary to understand why the study area was divided into subareas and how this Plan evolved. It includes a general description of the subareas and covers County topography, population, land use, and watershed areas. This is an important first step in understanding and managing water resources in the County.

2.1 General Description

The County is bordered on the south and west by Fresno County, on the north by Mariposa and Merced Counties, and on the east by Mono County. It is located approximately 20 miles from the Fresno metropolitan area, 166 miles from the Bay Area, 240 miles from Los Angeles, and 160 miles from the Pacific Ocean. The County has a major transportation corridor in Highway 99, an all-season freeway allowing access year round. It is positioned to take advantage of increasing export trade in the Pacific Basin and has reasonable proximity to the Silicon Valley.

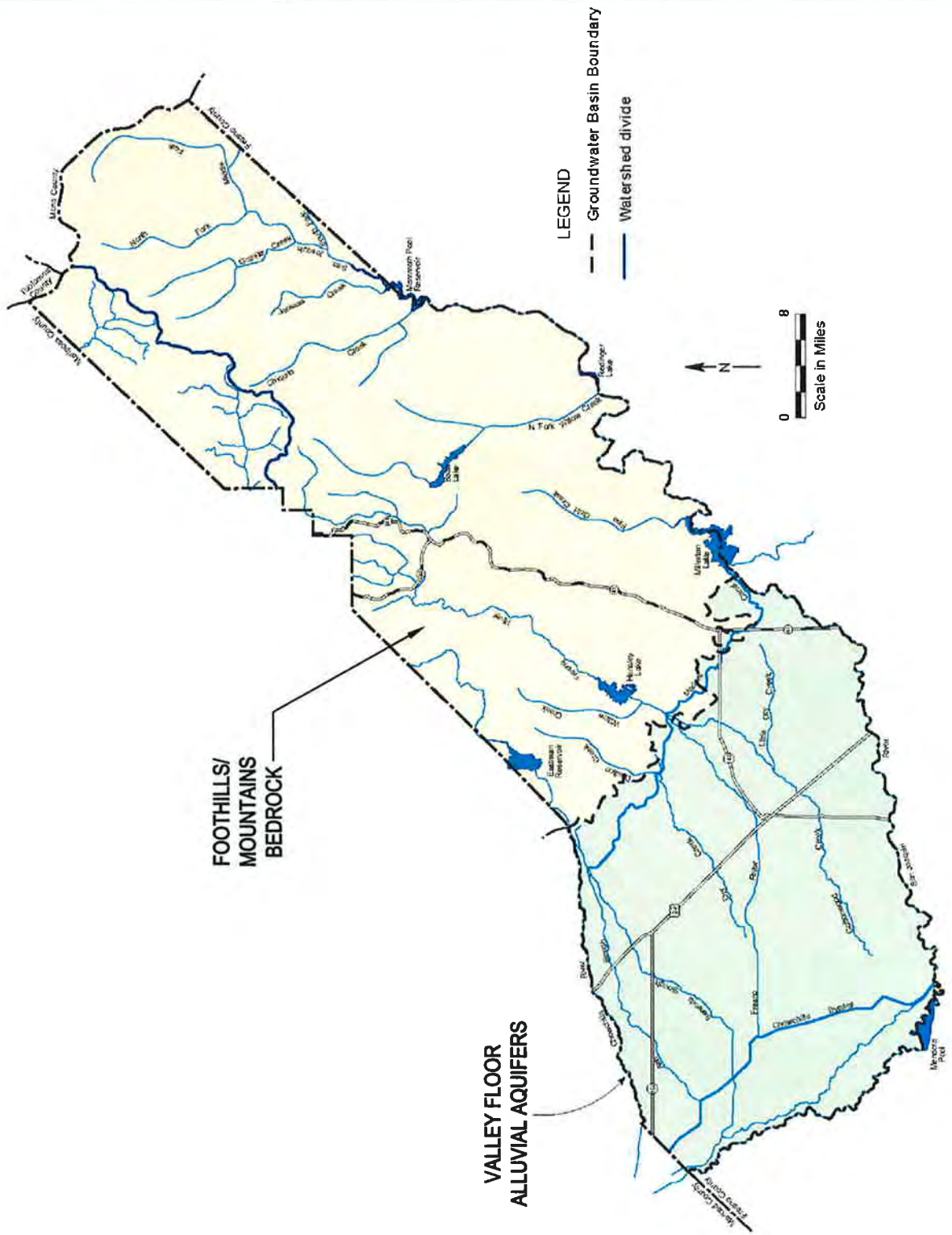
Madera County is receptive to industry, has local elected officials and an adequate housing supply, has land costs significantly lower than Fresno County, and is in close proximity to recreational areas. Agriculture is the largest industry in the County, accounting for approximately 30 percent of the employment. Government, another significant sector, accounts for approximately 20 percent and services make up about 17 percent of the total employment.

The County's growing population will require a range of goods and services that should ultimately fuel the regional economy. This growth will largely depend on how the County manages its water resources.

2.2 County Regions and Study Areas

The County has been divided into two main study regions, as shown in Figure 2-1, in recognition of the hydrogeologic differences. The relatively flat-lying western third of the County, which overlies an alluvial aquifer, is referred to as the Valley Floor. The remaining eastern two-thirds of the County, which consists of the foothills and mountains of the Sierra Nevada, is referred to in this Plan as the Foothills and Mountains. Although there are hydrogeologic differences between the two regions, there are opportunities to develop projects, programs, and policies that will improve water supply reliability with mutual benefit to the two regions of the County.

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COUNTY OF MADERA
 INTEGRATED REGIONAL WATER
 MANAGEMENT PLAN
MADERA COUNTY STUDY REGION

BEC
 PROJECT NO.
 22203.00

FIGURE
2-1

2.2.1 Valley Floor

The incorporated cities of Chowchilla and Madera are located in the Valley Floor and account for approximately 50 percent of the County’s population. The unincorporated communities in the Valley Floor include Berenda, Fairmead, Madera Ranchos, and Rolling Hills.

2.2.2 Foothills and Mountains

The communities in the Foothills and Mountains are unincorporated. The major communities include Ahwahnee, Bass Lake, Coarsegold, North Fork, Oakhurst, O’Neals, and Raymond. Focused hydrogeologic studies of four of the major populated and developing areas in the Foothills and Mountains have been completed as part of this Plan. These areas include Oakhurst, North Fork, Coarsegold, and Raymond-Hensley Lake as shown in Figure 2-2.

2.3 Population

Historic population estimates for the County were obtained from the California Department of Finance (DOF) Report E-4. These estimates are summarized in Table 2-1 and Figure 2-3. They show that the County has historically experienced a rapid, relatively uniform rate of population growth.

The County’s population increased by approximately 40 percent from 88,090 people in 1990 to 123,109 people in 2000. Compared to California’s total population growth of 14 percent over the same period, the County is one of the fastest growing areas in California.

Table 2-1. County of Madera Population (2000-2007)^(a,b)

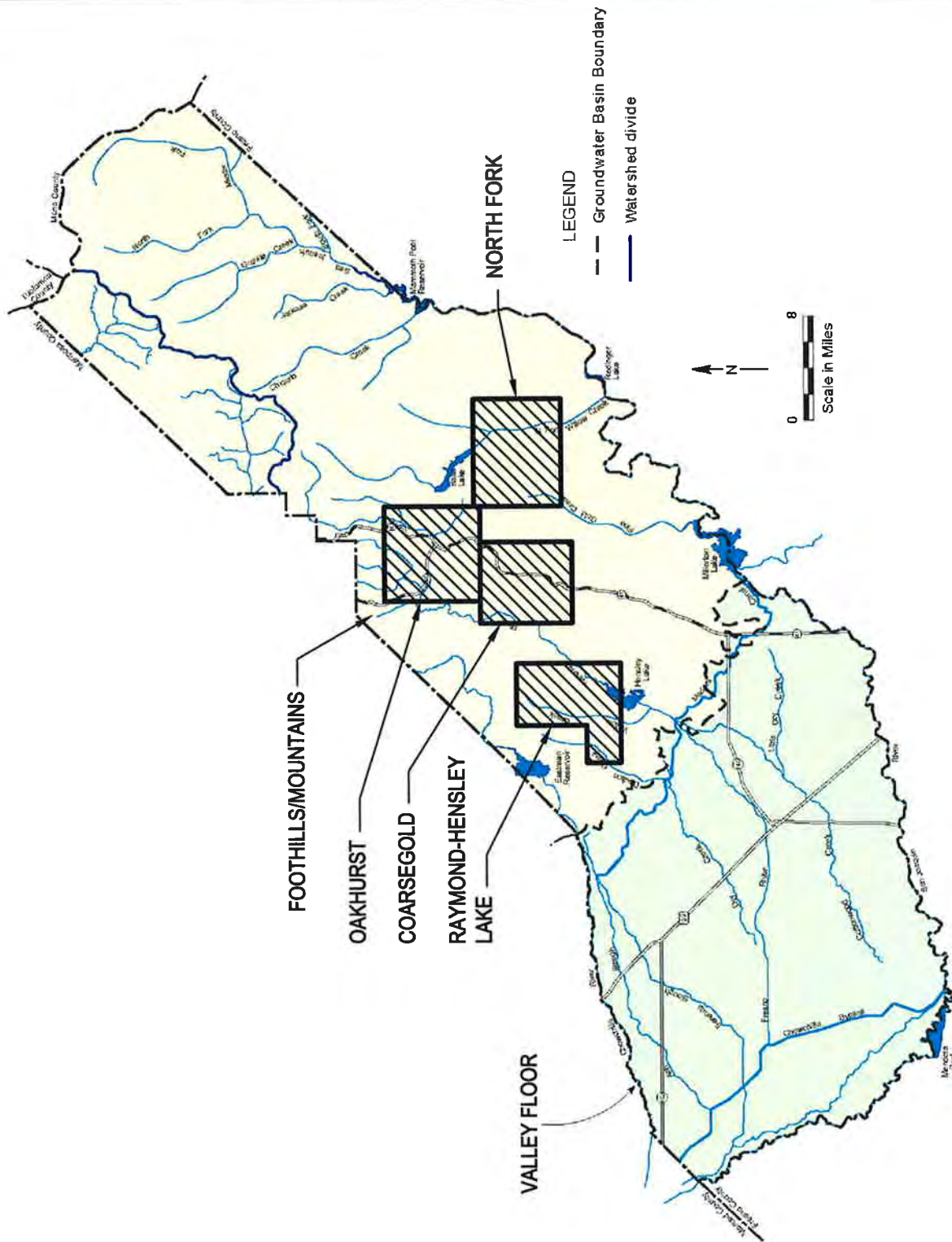
Area	2000	2001	2002	2003	2004	2005	2006	2007
City of Chowchilla	14,416	14,421	13,951	14,415	15,551	16,079	17,145	17,827
City of Madera	43,205	44,414	45,682	47,364	48,986	50,914	52,892	55,780
Unincorporated	65,488	66,982	68,770	70,374	72,372	74,205	75,161	75,114
County Total	123,109	125,817	128,403	132,153	136,909	141,198	145,198	148,721

^(a)Based on DOF population estimates for the County of Madera (Report E-4).

^(b)All estimated population numbers are as of January 1 of the given year.

From 2000 to 2007, the County’s population increased by 20 percent, representing an annual growth rate of approximately 3 percent.

The County’s population is anticipated to almost double to approximately 273,000 by 2030 based on projections by the DOF. However, according to Madera County Planning Department estimates, population growth based on area-specific plans in the County (Table 2-2) indicate the population of the County is more likely to be approximately 355,000 by 2030. This equates to an annual average growth rate of 3.8 percent. The additional population by 2030 will have significant water supply implications for the County.



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COUNTY OF MADERA
 INTEGRATED REGIONAL WATER
 MANAGEMENT PLAN

LOCATION OF STUDY SUBAREAS

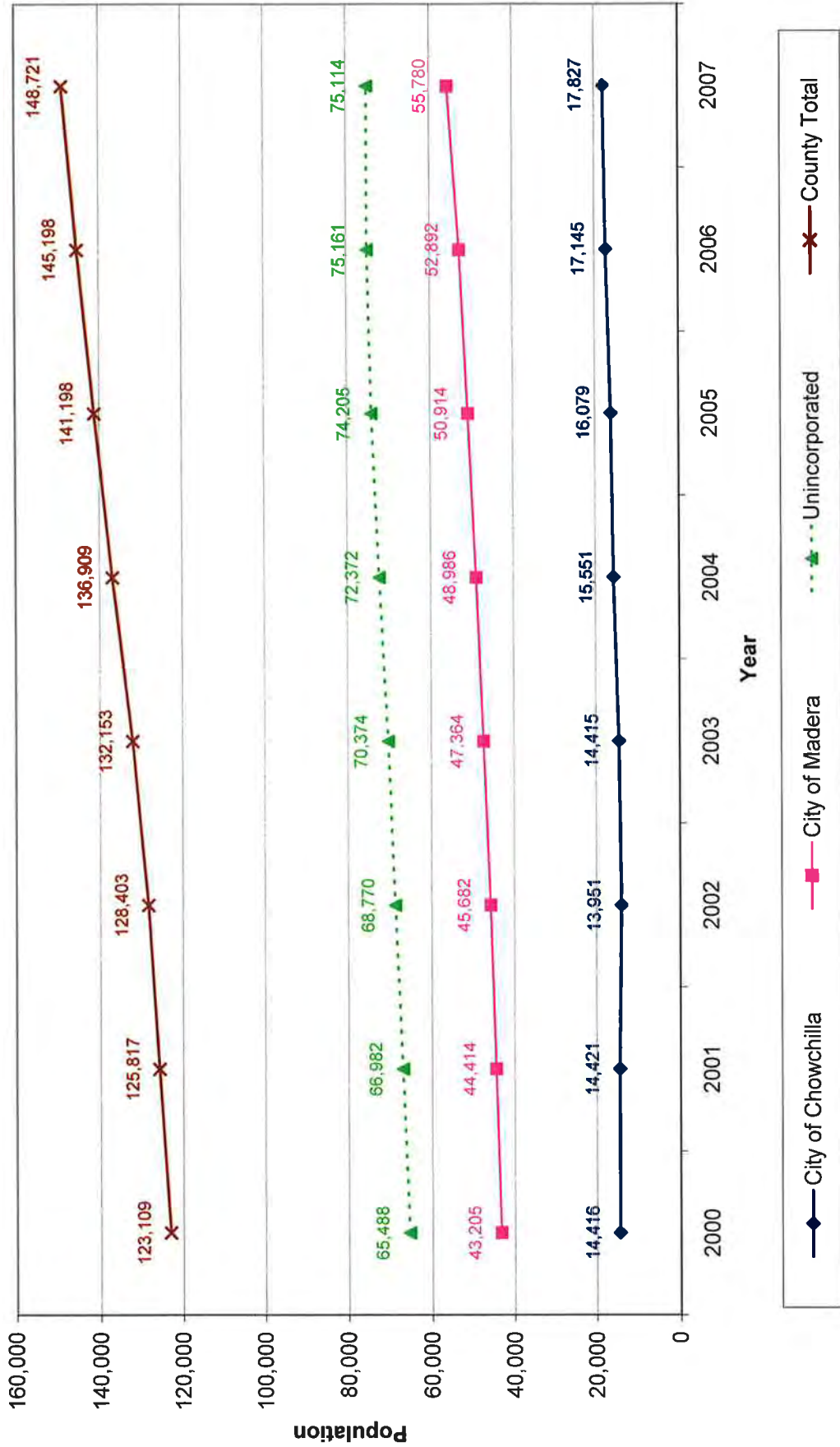
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FIGURE

2-2

Figure 2-3. County of Madera Estimated Population



Source of Data: California Department of Finance Report E-4

Report Tables.xls
 Fig 2-3 Population Chart
 Last Revised: 08/27/07

Table 2-2. County of Madera Projected Population

Study Area	Community	2030^(a)
Valley Floor	City of Chowchilla	29,760
	City of Madera	137,350
	Unincorporated	127,500
	<i>Subtotal</i>	294,610
Foothills and Mountains	Ahwahnee	6,252
	Bass Lake	1,129
	Coarsegold	24,965
	North Fork	5,550
	Oakhurst	13,274
	O'Neals	6,150
	Raymond	3,587
	<i>Subtotal</i>	60,907
County Total		355,517

^(a)Based on Madera County Department of Planning estimates in 2007.

2.4 Topography

Ground surface elevations in the County vary widely from 180 feet above mean sea level to approximately 13,000 feet. The lowest elevations in the County are located in the relatively flat Valley Floor and range from 180 feet to about 300 feet at the base of the foothills. The City of Chowchilla is at 180 feet in elevation, with the City of Madera at 237 feet.

Ground surface elevations in the Foothills and Mountains range from 300 feet at the base of the foothills to approximately 13,000 feet at the crest of the Sierra Nevada (Mount Ritter 13,157 feet). The Foothills and Mountains are characterized by a variety of topographic features from gently rolling hills to steep mountains.

2.5 Land Use

Land use information was received from the County's Planning Department and is generally based on the County's General Plan. The County projected land uses are shown in Table 2-3, Figure 2-4 and Figure 2-5. Proposed developments received by the County's Planning Department are expected to add approximately 40,000 dwelling units if approved, as shown in Figure 2-6. Land uses in the County are discussed by subarea below.

2.5.1 Valley Floor Land Uses

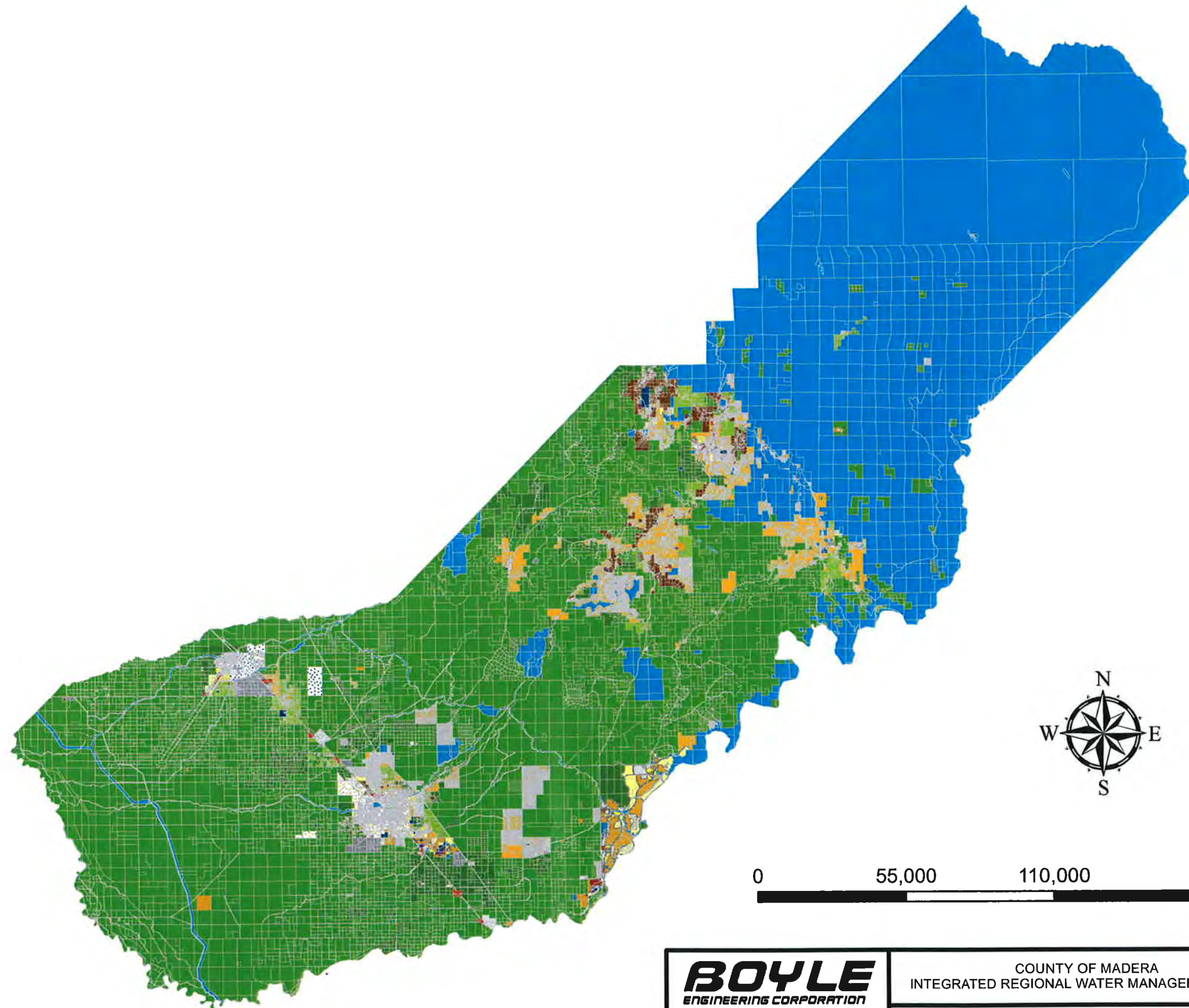
The predominant land uses in the Valley Floor include agricultural, residential, commercial/institutional, industrial, and landscape irrigation. All of these land use types can be found in the cities of Chowchilla and Madera, with the exception of agricultural use, which comprises most of

Table 2-3. Land Use Map Acreages

	Land Use	Square Feet (x1,000,000)	Acreage	Square Miles	Percentage
1	Agriculture	2,102.02	48,256	75.40	3.50
2	Agriculture Exclusive	29,168.50	669,617	1,046.28	48.58
3	Agriculture Residential	628.78	14,435	22.55	1.05
4	Blank	3.39	78	0.12	0.01
5	Community Commercial	97.29	2,233	3.49	0.16
6	City of Chowchilla	210.67	4,836	7.56	0.35
7	City of Madera	363.85	8,353	13.05	0.61
8	Heavy Commercial	17.59	404	0.63	0.03
9	High-Density Residential	25.26	580	0.91	0.04
10	Heavy Industrial	208.30	4,782	7.47	0.35
11	Highway Service Commercial	42.99	987	1.54	0.07
12	Institutional Area	0.36	8	0.01	0.00
13	Low-Density Residential	372.95	8,562	13.38	0.62
14	Light Industrial	150.86	3,463	5.41	0.25
15	Medium-Density Residential	58.12	1,334	2.08	0.10
16	MUC	2.17	50	0.08	0.00
17	Neighborhood Commercial	13.48	310	0.48	0.02
18	OMU	1.52	35	0.05	0.00
19	Open Space	23,027.43	528,637	826.00	38.35
20	Public Institutional	73.64	1,691	2.64	0.12
21	Professional Office	14.42	331	0.52	0.02
22	Rural Estates Residential	525.11	12,055	18.84	0.87
23	RFMU	2.57	59	0.09	0.00
24	Rural Residential	2,235.16	51,312	80.18	3.72
25	Transit Station	0.28	6	0.01	0.00
26	Very Low-Density Residential	698.10	16,026	25.04	1.16
	Total	59,346.72	1,378,439	2,153.81	100.00

the land use outside the urban areas in the Valley Floor. Residential land use densities in the cities average 3.0 to 4.5 persons per dwelling unit. The commercial land uses comprise a mixture of shopping, financial, restaurant, and service-oriented businesses normally found in small urban areas. There are several areas of industrial zoned property within the cities and local agencies are aggressive in their attempts to attract new businesses and industries in order to help mitigate the high unemployment rate experienced in both cities and Madera County as a whole.

The City of Madera plans to make substantial changes in the institutional/governmental sector in upcoming years. The City government center is overcrowded and has obsolete facilities. Plans are ongoing for relocation and/or reconstruction of City government buildings. The impact of these changes on water resources consumption and new connections should be in proportion to population



- Legend**
- Land_Use_Revised**
- Agriculture
 - Agriculture Exclusive
 - Agriculture Residential
 - Community Commercial
 - Chowchilla
 - City of Madera
 - Heavy Commercial
 - High Density Residential
 - Heavy Industrial
 - Highway Service Commercial
 - Institutional Area
 - Low Density Residential
 - Light Industrial
 - Medium Density Residential
 - Mixed Core
 - Neighborhood Commercial
 - Open Space/Water Body
 - Public Institutional
 - Professional Office
 - Rural Estates Residential
 - Rural Residential
 - Transit Station
 - Very Low Density Residential



SOURCE: MADERA COUNTY 1995 GENERAL PLAN

BOYLE ENGINEERING CORPORATION <small>1360 E. Spruce Avenue Suite 101 Fresno, CA 93720 559-448-8222 WWW.BOYLEENGINEERING.COM</small>	COUNTY OF MADERA INTEGRATED REGIONAL WATER MANAGEMENT PLAN	BEC PROJECT NO. 22203.00	FIGURE 2-4
	LAND USE PLAN		