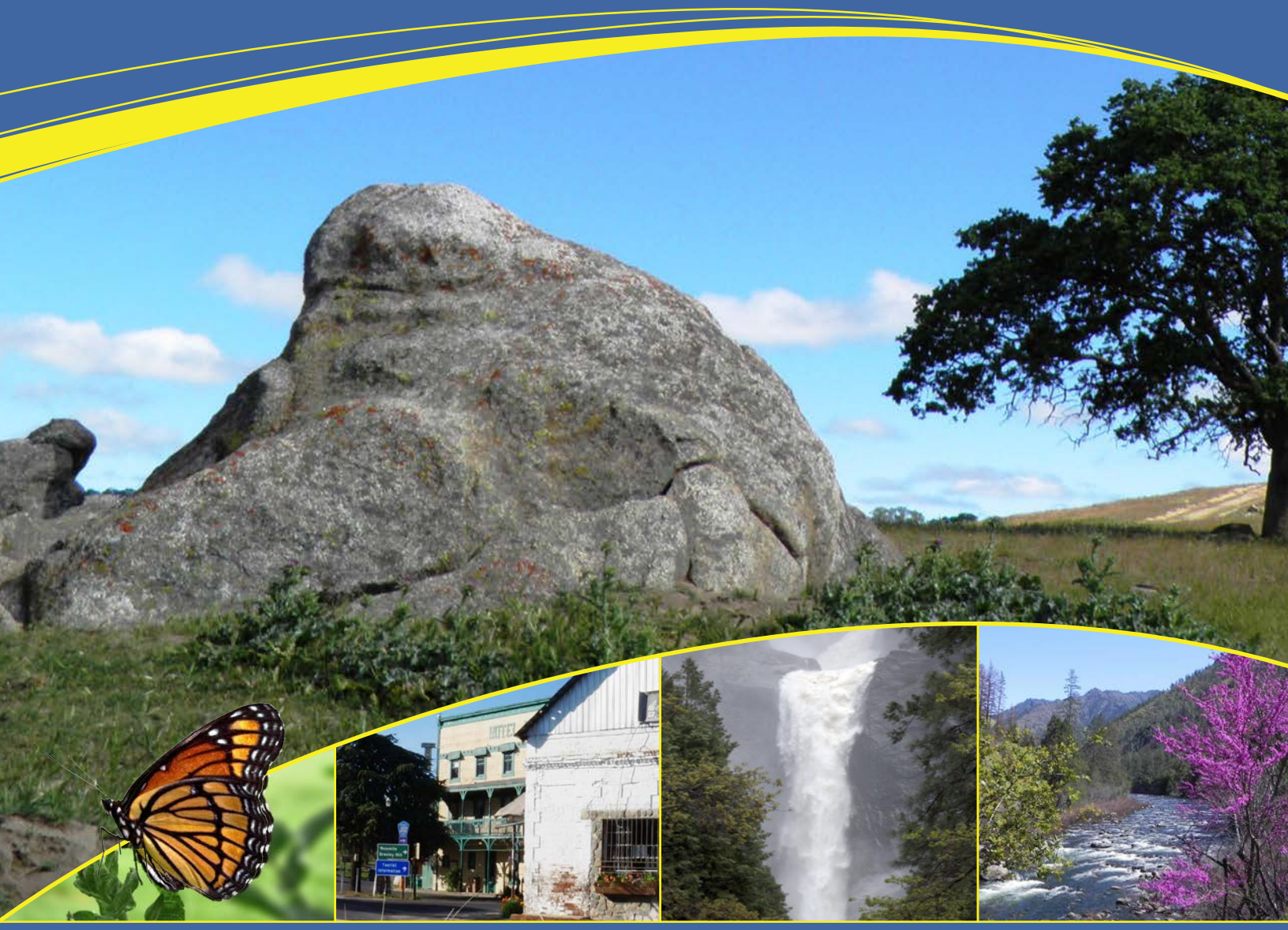
Yosemite-Mariposa

Integrated Regional Water Management Plan

July 2014



Photos Courtesy of Kristen Boysen, the Sierra Foothill Conservancy, Pat Garcia, Dan Horner

Prepared By
Kennedy/Jenks Consultants

Kennedy/Jenks Consultants

10850 Gold Center Drive, Suite 350
Rancho Cordova, California 95670
916-858-2700
FAX: 916-858-2754

Yosemite-Mariposa Integrated Regional Water Management Plan

July 2014

Prepared for

Mariposa County Resource Conservation District
P.O. Box 746/5039 Fairgrounds Road
Mariposa, CA 95338

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Table of Contents

Table of Contents (cont'd)

Table of Contents (cont'd)

Table of Contents (cont'd)

Table of Contents (cont'd)

Table of Contents (cont'd)

List of Tables

Table of Contents (cont'd)

List of Figures

Table of Contents (cont'd)

List of Appendices

Abbreviations and Acronyms

Abbreviation	Description
AB	Assembly Bill
ACOE	Army Corps of Engineers
AF	acre-feet
AFY	acre-feet per year
Basin Plan	Sacramento/San Joaquin Water Quality Control Plan
BLM	United States Bureau of Land Management
BMP	best management practices
BSSC	California Bird Species Special Concern
C	community
CABY	Consumnes, American, Bear, and Yuba IRWM
CALFED	CALFED Bay-Delta Program
CAL FIRE	California Department of Forestry and Fire Protection
CCE	California Candidate Endangered
CCT	California Candidate Threatened
CDEC	California Data Exchange Center
CDF	California Department of Forestry
CDF & FP	California Department of Forestry and Fire Protection
CDFW	California Department of Fish and Wildlife
CE	California Endangered
CEDEN	California Environmental Data Exchange Network
CenCal	Central California
CEQA	California Environmental Quality Act
CFP	California Fully Protected
CFS	cubic feet per second
CIMIS	California Irrigation Management Information System
CIP	capital improvement plan
CO	company
CSA	county service area
CSA1-M/CWS	County Service Area 1-M, Coulterville Water and Sewer

Abbreviation	Description
CSA1-M/MP	County Service Area 1-M, Mariposa Pines
CSA1-M/SZ1	County Service Area 1-M, Sewer Zone No. 1
CSC	California Species of Special Concern
CSD	community service district
CT	California Threatened
CWA	Federal Clean Water Act
CWC	California Water Code
CWP	California Water Plan
CWPP	Community Wildfire Protection Plan
DAC	disadvantaged community
DBP	disinfection byproducts
DMS	data management system
DWR	California Department of Water Resources
E. COLI	Escherichia Coli
EDC	Economic Development Corporation of Mariposa County
EJ	environmental justice
FC	Federal Candidate
FE	Federal Endangered
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FT	Federal Threatened
GAMA	Groundwater Ambient Monitoring and Assessment
GHG	green house gas
GIS	geographic information system
GPM	gallons per minute
GUIDELINES	Integrated Regional Water Management Guidelines for Proposition 84 and Proposition 1E
ID	irrigation district
in.	inches
INC	incorporated
IRWM	Integrated Regional Water Management
IRWM Plan	Integrated Regional Water Management Plan
LA	Los Angeles

Abbreviation	Description
LAFCO	local agency formation commission
LDPCSD	Lake Don Pedro Community Services District
LHMP	local hazard mitigation planning
LUST	leaking underground storage tanks
MAC	Mokelumne/Amador/Calaveras IRWM
MAF	million acre-feet
MCFSC	Mountain Communities Fire Safe Council
MCRCD	Mariposa County Resource Conservation District
MERG	Mariposans for the Environment and Responsible Government
MG/L	milligrams per liter
MGD	million gallons per day
MHI	median household income
MID	Merced Irrigation District
MOU	memorandum of understanding
MPN	most probable number
MPT	measurable planning target
MPUD	Mariposa Public Utility District
MPWD	Mariposa Public Water District
MSG	Merced County Stream Group
MSR	Municipal Service Reviews
MT	mountain
MW	megawatts
NC	transient non-community
NEPA	National Environmental Policy Act
NGO	non-governmental organization
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NTNC	non-transient non-community
NTU	nephelometric turbidity unit
OES	office of emergency services
PBMWC	Ponderosa Basin Mutual Water Company
PEC	project evaluation committee

Abbreviation	Description
PG&E	Pacific Gas and Electric
PIER	California Public Interest Energy Research
POC	public outreach committee
PVC	polyvinyl chloride pipe
RAP	regional acceptance process
RCD	resource conservation district
Region	Yosemite-Mariposa Region
RMS	resource management strategies
RWAC	regional water advisory council
RWMG	regional water management group
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SDAC	severely disadvantaged communities
SDWA	Safe Drinking Water Act
SFC	Sierra Foothill Conservancy
SMART	specific, measurable, attainable, relevant, time-based
SNC	Sierra Nevada Conservancy
SRA	state responsibility areas
SWAMP	Surface Water Ambient Monitoring Program
SWRCB	State Water Resources Control Board
TDN	total dissolved nitrogen
TMDL	total maximum daily load
TPA	town planning area
UC	University of California
UMRWC	Upper Merced River Watershed Council
US	United States
USBR	United States Bureau of Reclamation
USDA	United States Department of Agriculture
USEPA or EPA	United States Environmental Protection Agency
USFS	United States Forest Service
USGS	United States Geologic Survey
UV	ultraviolet
WDR	water discharge requirements

Abbreviation	Description
WF	wildfire
WFU	wildfire use
WUE	water use efficiency
WUI	Wildland Urban Interface
WWTP	wastewater treatment plant
YAAS	Yosemite Area Audubon Society
YACSD	Yosemite Alpine Community Services District
Y-M	Yosemite-Mariposa
YNP	Yosemite National Park

Executive Summary

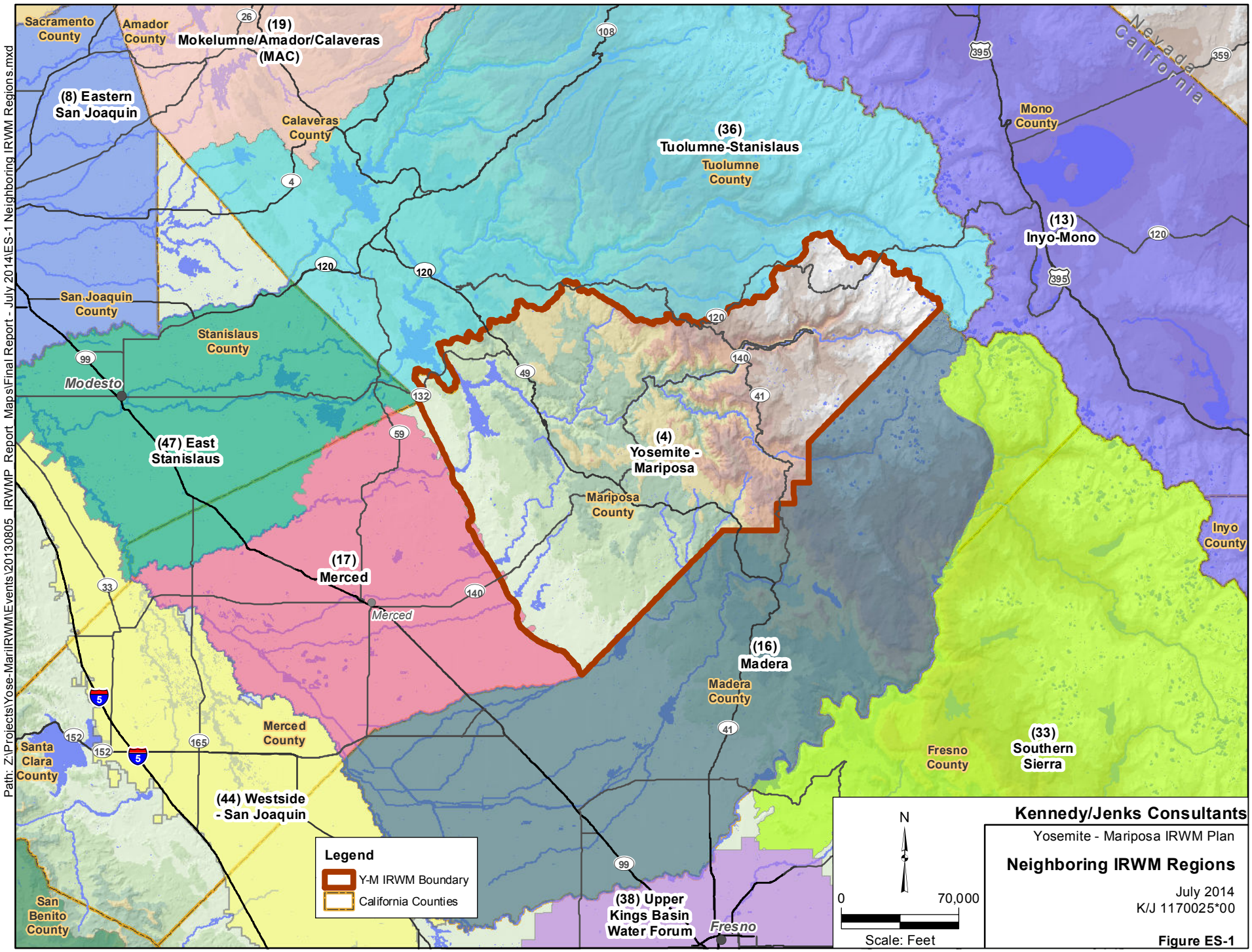
This Integrated Regional Water Management Plan (IRWM Plan) defines a clear vision of the management of water resources in the Yosemite-Mariposa Region (Region) and highlights important actions needed to help accomplish that vision through the year 2035. The Yosemite-Mariposa (Y-M) IRWM Plan is a volunteer, collaborative effort by local agencies, organizations and residents to develop strategies to manage the water and natural resources within the Region. The purpose is to meet long-term water needs providing both ecosystem and sustainable water supply benefits for end users. The Plan will also provide a way for the region to acquire funding to complete projects that address water quality, water supply, safe drinking water, water reliability, flood and stormwater management and ecosystem protections. This IRWM Plan is intended to be an integrated planning tool in compliance with the *Integrated Regional Water Management Guidelines for Proposition 84 and 1E* published by the California Department of Water Resources (DWR) in November 2012. This planning tool will help bring stakeholders together for the foreseeable future and identify, plan, and execute actions to better manage water in the Region and to accomplish more than agencies and organizations could do individually.

Efforts to compile this Plan have taken many years and the dedication, time and resources of more than 20 water purveyors; local, state and federal agencies; natural resources advocates, and other stakeholders. The effort has resulted in an opportunity to accomplish much more than any one agency could have achieved and has fostered better stewardship of resources throughout the planning horizon. This compilation of integrated goals, objectives, background, resource management strategies, and projects is the product of input gathered from stakeholder involvement, public contributions, research, and technical studies and is custom tailored to meet the needs of the Region.

Introduction (Section 1)

Y-M Landscape with View of Bagby Bridge
Credit: Pat Garcia

This IRWM Plan is the first regional watershed-management plan of its kind in the Y-M Region. Its intent is to address the many major water-related needs/challenges and conflicts within the Region, including water quality, local water supply reliability, and better integrate of water and land use management, fuel management for wildfire prevention and resource stewardship and ecosystem protection. The Y-M Region is an area with large forested areas, including 53% of the Region which is managed as federal lands by Yosemite National Park, the Bureau of Land Management, and the Sierra and Stanislaus National Forests. Although the Region does not have a large population, the Merced River watershed, which is about 64% of the Region, is a major tributary to the San Joaquin River, which combines with other Delta tributaries to provide water for millions of people in the San Joaquin Valley and Bay Area, and water for irrigating hundreds of thousands of acres of prime farmland.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Sacramento County
Amador County
(19) Mokelumne/Amador/Calaveras (MAC)
(8) Eastern San Joaquin
Calaveras County
(36) Tuolumne-Stanislaus
Tuolumne County
Mono County
Nevada
California
(13) Inyo-Mono
San Joaquin County
Stanislaus County
Modesto
(47) East Stanislaus
(4) Yosemite - Mariposa
Mariposa County
Inyo County
(17) Merced
Merced
(16) Madera
Madera County
Merced County
Santa Clara County
(33) Southern Sierra
Fresno County
(44) Westside - San Joaquin
San Benito County
(38) Upper Kings Basin Water Forum
Fresno
Legend
Y-M IRWM Boundary
California Counties
N
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70,000
Scale: Feet
Kennedy/Jenks Consultants
Yosemite - Mariposa IRWM Plan
Neighboring IRWM Regions
July 2014
K/J 1170025*00
Figure ES-1

The formation of the Yosemite-Mariposa Region began with the larger CenCal Region that includes a group of stakeholders located in the central portion of California. This Region was submitted in response to the original Proposition 84 Integrated Regional Water Management Plan guidelines for the Regional Acceptance Process (RAP). Following the change as agreed by DWR, the Y-M Region boundary was settled coincident with the Mariposa County line and is bounded on all sides by other IRWM regions as shown on Figure ES-1. The region is fully located within the San Joaquin Funding area as defined by DWR.

The governance of the Y-M IRWM includes both a Regional Water Management Group (RWMG) of 5 entities and a broader Regional Water Advisory Council (RWAC) of community representatives who are signatories to a Memorandum of Understanding (MOU). In addition there are Agency Partners who are non-voting members of the RWAC. The RWAC's role is to identify regional water-management issues and needs, and establish goals and objectives, plans and projects, and future funding and governance.

Y-M IRWM Plan Meeting
Credit: Pat Garcia

Inclusion of stakeholders and a consensus-driven process have been the cornerstones to the work throughout the Y-M IRWM Plan development process. Extensive stakeholder outreach was conducted to help ensure that the Plan reflects the water-related needs of the entire Region, promotes the formation of regional partnerships, and encourages increased coordination with state and federal agencies. Stakeholder coordination and outreach was initiated for several years prior to the preparation of the IRWM Plan and has been a continual process throughout Plan development. The planning process centered around stakeholder meetings, which were open to the public. Stakeholders were invited to participate through facilitated discussions and review of draft documents; the meetings were announced to a broad distribution list via e-mailed invitations and a notice was published in the newspaper announcing the intent of the group to prepare the Plan as well as to adopt the Plan, with information on how to find more information regarding the process.

IRWM Plan development was iterative as plan content was prepared based on the discussion of each topic, as outlined in Figure ES-2, and then was provided for public review and comment. The draft content was discussed at the meeting and then revised through an iterative process based on comments received by the stakeholders until consensus was reached. As described below, a Plan Review Committee was convened on an as needed basis to assist in refining content and resolving any conflicting comments. At the end of the planning process, the agreed upon content was synthesized into this IRWM Plan for final public review and RWMG member adoption.

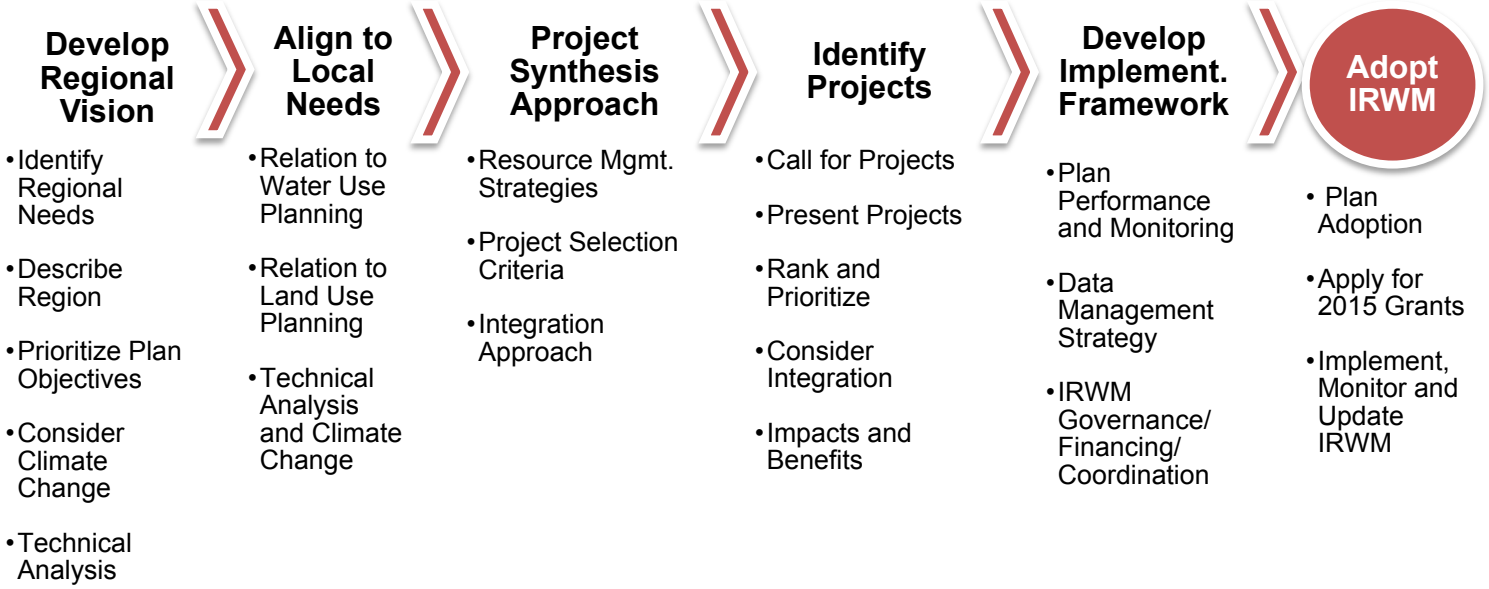
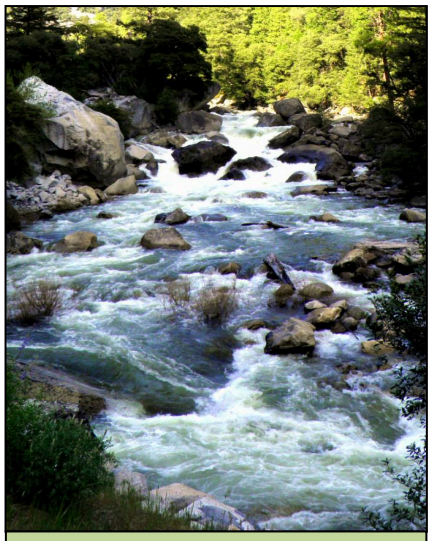


Figure ES-2: IRWM Planning Process Overview

The IRWM Plan will be adopted by the RWMG and any project proponents seeking IRWM program grant funding. An effort will be made to have the Plan adopted by all participants in the planning process, including each of the RWAC members. It is currently anticipated that the Plan adoption will begin once the final IRWM Plan has been released in the summer of 2014.

The Yosemite-Mariposa Region (Section 2)

This section describes the Region, focusing on the natural and manmade features that relate to the water and environmental resources of the Region. As it is impossible to describe in detail a vast region the size of Yosemite-Mariposa in just a few pages, this section introduces the many resources of the Region, and provides context for understanding many aspects of the Plan. For example, the depictions of water-related challenges and opportunities (presented in Sections 2 and 3) are designed to correlate with the objectives in subsequent sections. In this way the Plan incrementally builds an overall understanding of the Region's water management actions that will contribute towards addressing challenges and opportunities introduced in these initial sections.



Merced River
Credit: Kristen Boysen, Sierra Foothill Conservancy

The Region is located on the Western slope of the Sierra Nevada Mountain range entirely in Mariposa County, California bordering the Central Valley as shown on Figure 1-1. The Region has a varied terrain from rolling foothills in the western portion of the Region to rugged mountainous terrain in the east with a land area of about 1,461 square miles (935,228 acres). The Region encompasses much of the high Sierra headwaters of the Merced River which are in Yosemite National Park as well as the foothill watersheds of the lower Mariposa County and the

Fresno-Chowchilla River many of which are in the Stanislaus or Sierra National Forests. Terrain varies throughout the Region from granite peaks exceeding 11,000 feet in the east to grasslands below 1,000 feet at the western border of the Region. Variation throughout the middle of the Region includes conifer forests, glacially carved valleys, mountain meadows, and oak woodlands.

The Yosemite-Mariposa Region is sparsely populated, with approximately half the 18,000 residents living in small communities dotting the western portion of the Region. The remainder of the population resides in rural settings. There are no incorporated cities in Mariposa County although the larger communities include the Town of Mariposa, Yosemite Village, and Lake Don Pedro. Native American Tribes are also important to the region's history and present day culture. During late pre-contact and early contact times the Southern Sierra Miwok inhabited the lower banks of the Merced River and the Chowchilla River, as well as Mariposa Creek with an inhabited range from the Sierra Crest, the divide between the Tuolumne and Merced Rivers, the Fresno River and along the base of the Sierra foothills. They also actively travelled across the Sierra crest.

The water resources of the Yosemite-Mariposa Region have been developed to make use of the abundant water resources in the upper watersheds for agricultural, municipal, and other uses in the Central Valley. West of the Y-M Region, the Merced River and Mariposa Creek eventually flow into the Lower San Joaquin River, a tributary to the Sacramento-San Joaquin Bay-Delta estuary. The Merced River begins high in the Sierra Nevada and provides a reliable, year round water source through rain, snow melt and melting glaciers. Despite the vast surface water originating in the region, groundwater resources make up the majority of the Region's local water supplies. The majority of the Region's groundwater supplies originate from hard rock wells in the plutonic granites of the Sierra Nevada.

Existing and Future Conditions (Section 3)

Section 3 describes the existing and expected future conditions for the Yosemite-Mariposa Region (Y-M Region or Region) that are relevant to water resources management. The information is organized and presented as it relates to the major topic areas of water supply including a water balance, water demands, water-related infrastructure, water quality, flood protection, environmental resources, and the potential effects of climate change. Important information is provided regarding key water management infrastructure (both constructed and naturally occurring), summarizes and presents important water-related data, introduces some of the major challenges, and offers observations about the current water management system.

The Y-M IRWM Plan references and summarizes a number of original source data, technical reports and other information to provide an overview of conditions throughout this IRWM Plan. An IRWM Plan is a high level representation of many important topics, and as such the reference materials should be reviewed for a more comprehensive discussion of the issues raised throughout the Plan.

The section importantly outlines a range of major water related issues, needs, challenges and opportunities that are facing the region in each major category, as follows:

Water Demands

- Balancing local water demand growth with resource availability (especially as related to groundwater) and downstream water export needs
- Water use efficiency programs provide means to efficiently use local supplies

Water Supply

- Local surface supplies are limited and there are significant downstream exports
- Groundwater use is not managed and supply reliability is not well understood
- Climate change effects on supply are unknown

Lake Don Pedro CSD Water Treatment Plant
Credit: Ralph Felix, LDPCSD

Water-Related Infrastructure

- Aging water supply and distribution infrastructure is not being replaced in a timely manner
- Inadequate water storage and resources for adequate community fire protection
- Compliance with wastewater treatment regulatory standards for community wastewater systems and private septic systems

Water Quality Conditions

- Compliance with surface water and groundwater quality regulations
- Management and restoration of impaired surface water bodies
- Protection of groundwater quality
- Improvement of forest and watershed management actions
- Prevention of catastrophic wildfire and mitigation of resulting water quality impacts

Ecological Processes and Environmental Resources

- Protection and restoration of anadromous fisheries, threatened, endangered and sensitive aquatic and terrestrial species
- Restoration of functional wildlife habitat
- Management of the spread of aquatic and terrestrial invasive species

In addition to all of the challenges listed above, climate change is expected to have various impacts on the Region including: 1) changing hydrology due to a shift from snow to rain precipitation, 2) higher fire risk due to warmer, drier conditions over the year, and associated impacts on water quality and flooding, 3) longer and drier conditions over the year, and associated impacts on water quality and flooding, 4) longer and more severe multi-year droughts, 5) more evapotranspiration and thus less runoff from mountain headwaters due to longer annual growing seasons at higher elevations, 6) greater summer water demand from all categories of users and 7) habitats and species shifts.

Relation to Local Water and Land Use Planning (Section 4)

Water resources and land use planning in the Yosemite-Mariposa (Y-M) Region are inherently linked due to the connection between the uses of land (i.e., for rural residences, forestry, agricultural, and other activities) and the ways in which water is conveyed and used (i.e., for both consumptive and non-consumptive uses within and outside the Region). Land use changes that occur without proper planning or collaboration can significantly impact water resources/quality and the availability and reliability of supply for urban, agricultural, and ecosystem benefits. Collaboration between water managers and land use managers can help mitigate land use decisions to avoid detriment to water resources.

The Y-M IRWM Plan in no way replaces or supersedes local planning, but is intended to incorporate and strengthen local planning efforts and results. This Plan will support local water management organizations in making local decisions and taking local actions that help accomplish a shared vision for the whole Region. This section contains a description of how the Y-M IRWM Plan incorporates its water management planning and implementation activities with local resource management planning activities.

The RWAC and land use managers are considering ways in which to improve collaboration on a variety of topics and areas of focus that integrate land and water use planning, such as flood plain management, flood control planning, groundwater management, treatment and conveyance facilities, stormwater management, water conservation efforts, watershed management, recreational area management, land use changes, General Plan updates, water supply for emergency planning, and habitat management.

Goals and Objectives (Section 5)

The goals and objectives presented in section 5 represent the foundational intent of this IRWM Plan. Formulating meaningful and relevant goals and objectives for the Yosemite-Mariposa Region (Region) required more collaboration and collective interaction than the work documented in any other section of this Plan. The goals and objectives were developed over a 6-month period, with four discussions with participants at the main RWAC meetings and an additional two meetings and two conference calls with the Objectives subcommittee. The draft goals and objectives were circulated for review and comment to the RWAC or subcommittee five times to allow for thorough consideration and refinement of what ultimately will direct the Plan.

Table ES-1 provides a summary of the nine identified Plan Goals with their associated objectives and priority levels assigned based on consultation with stakeholders.

Table ES-1: Plan Objectives Prioritization

Plan Goal and Objective	Importance	Urgency
Goal #1: Provide/Improve Reliable Water Supply within the Region		
A. Provide reliable water supplies to meet all domestic water needs in the Region by 2035	High	High
B. Improve understanding of groundwater usage, quality, and reliability throughout key groundwater use areas the Region by 2020	High	Med
C. Promote Water Use Efficiency (WUE) practices throughout the Region and educate 80% of households and businesses by 2020	Med	Med
D. Identify by 2019 and manage and conserve forest, wetlands, and range lands for enhancement of water supply by 2035	High	High
Goal #2: Ensure Reliable Community Water and Wastewater Infrastructure		
E. Assess and identify the current condition of private and community water systems and their plans, if any, for future improvements by 2018	High	High
F. Assess and identify the current condition of community wastewater systems and their plans, if any, for future improvements by 2020	High	Med
G. Rehabilitate or replace aging and inadequate water and waste water distribution/collection, treatment, and disposal infrastructure by 2035	High	High
Goal #3: Maintain or Improve Water Quality in the Region		
H. Identify and prioritize impacted watersheds by 2020	High	Med
I. Conserve and restore 10,000 acres of watersheds through improved forest and rangeland management practices and appropriate land use by 2020. Conserve and restore 20,000 acres by 2035	High	High
J. Implement water quality improvement activities where pollutants are identified by 2035	High	High
K. Promote sustainable ecosystem and vegetation management on agricultural and production land, primarily near riparian corridors in the first five years of the IRWM Program	Med	Med
Goal #4: Protect and Improve Wildlife Habitat		
L. Improve watershed health by preventing the establishment of or reducing/eliminating aquatic and terrestrial invasive species in at least 2 locations per year starting in 2017	High	Med
M. Protect special status and sensitive species and preserve and restore 10,000 acres by 2025 and 20,000 acres by 2035	High	Med
N. Conserve and ensure the presence of unfragmented wildlife corridor habitats	High	Med
Goal #5: Assess and Enhance Recreational Opportunities in the Region		
O. Evaluate existing and potential recreational opportunities by 2019	Med	Med
P. Enhance public access for recreation to waterways by 2035	High	Med

Plan Goal and Objective	Importance	Urgency
Goal #6: Develop Collaborative and Sustainable Partnerships Both Within and in Adjacent Regions		
Q. Identify, review and evaluate the effectiveness of ordinances and county planning related to water management in the Region by 2020	High	Med
R. Develop opportunities/data management system so that current scientific data can be made available to make informed, collaborative choices regarding water resources and land use planning throughout the Planning Period	High	Med
Goal #7: Reduce Risk of Catastrophic Fire		
S. Facilitate and coordinate fuel management policies and strategies in at least two locations per year of high hazard lands in the Region	High	High
Goal #8: Educate Stakeholders and County Residents about Water Issues through the IRWM Process to Inspire Public Action		
T. Use education and outreach annually that maintains or increases watershed stewardship resulting in water quality and ecological improvements	High	Med
Goal #9: Prepare for Impacts of Climate Change		
U. Educate the public regarding the findings of the Climate Change Vulnerability Checklist for the Region by 2015 and periodically update the checklist with updated information	Med	Med
V. Mitigate impacts of climate change by implementing cost-effective renewable energy production in at least one location by 2035 and promoting energy/water use efficiency in the Region	Med	Med
W. Mitigate flood risk associated with climate change by cooperating with Local Hazard Mitigation Planning flood risk updates and educating the public regarding flood prevention and mitigation measures	Med	Med

Resource Management Strategies (Section 6)

The Goals, Objectives, and Strategies presented in Section 5 for the Yosemite-Mariposa (Y-M) Integrated Regional Water Management (IRWM) Plan describe a range of areas in which regional stakeholders intend to improve water-related conditions in the Region over the plan horizon. The broad categorical actions required to achieve the goals and objectives mostly align with the Resource Management Strategies (RMS) identified in the draft California Water Plan (CWP) Update 2013 which are to be considered for applicability in an IRWM Plan. A RMS is a project, program, or policy that helps local agencies and governments manage their water and related resources. A diversified portfolio of RMS will help the Y-M Region to better prepare and mitigate for potential future conditions, such as climate change and severe drought. This section introduces the 36 RMS from the draft 2013 CWP and identifies those selected for inclusion in the Y-M IRWM Plan. Table ES-2 provides a summary of the RMS described in Section 6, divided into six management outcomes.

Table ES-2: Draft 2013 California Water Plan Objectives and RMS Summary

CWP Objectives	Resource Management Strategies
Reduce Water Demand	Agricultural Water Use Efficiency Urban Water Use Efficiency
Improve Flood Management	Flood Management
Improve Operational Efficiency and Transfers	*Conveyance – Delta** Conveyance – Regional/local System Reoperation Water Transfers
Increase Water Supply	Conjunctive Management & Groundwater Storage *Desalination (Brackish and Sea Water)** *Precipitation Enhancement** Municipal Recycled Water *Surface Storage – CALFED/State** Surface Storage – Regional/local
Improve Water Quality	Drinking Water Treatment and Distribution Groundwater/Aquifer Remediation Matching Water Quality to Use Pollution Prevention *Salt and Salinity Management** Urban Stormwater Runoff Management
Practice Resources Stewardship	Agricultural Land Stewardship Ecosystem Restoration Forest Management Land Use Planning and Management Recharge Area Protection Sediment Management Watershed Management
People and Water	Economic Incentives Outreach and Engagement Water and Culture Water-Dependent Recreation
Other Strategies	*Crop Idling for Water Transfers** Irrigated Land Retirement *Waterbag Transport/Storage Technology ** *Dewvaporation or Atmospheric Pressure Desalination* Fog Collection ** *Rainfed agriculture**

* RMS not applicable to Y-M IRWM Plan.

Project Selection and Prioritization (Section 7)

Section 7 describes the project solicitation, development, and review process that was used to select and prioritize projects for inclusion in the Yosemite-Mariposa (Y-M) IRWM Plan. The project review and prioritization process was designed to identify those projects, programs, and actions that contribute towards achievement of the Y-M Integrated Regional Water Management (IRWM) Plan Goals and Objectives as described in Section 5. It is envisioned that a similar process to that described in the following sections will be used for including additional projects in the Plan in the future.

The Project Evaluation Committee (PEC) received 51 project submittals during the Call for Projects which are summarized in Table ES-3. During the March 26, 2014 stakeholder meeting, project proponents were given the opportunity to present their project to the PEC and meeting attendees. The purpose of the project presentations was to provide a better understanding of the projects to improve scoring, identify projects which have potential for integration and determine if there are gaps in meeting the Plan Objectives.

Table ES-3: Project Summary

Project No.	Agency	Title	Total Project Cost
1	County of Mariposa	Replace Water Distribution Piping in Yosemite West Subdivision	$2,900,000
2	County of Mariposa	Develop Second Water Source for the Coulterville community	$700,000
3	County of Mariposa	Water Treatment for Arsenic Exceedance	$500,000
4	County of Mariposa	Replace Sewage Collection Piping in Yosemite West Subdivision	$2,500,000
5	County of Mariposa	Develop Second Water Source for Yosemite West Subdivision	$1,600,000
6	County of Mariposa	Expansion and Repair of Leachfields in the Yosemite West Subdivision	$1,220,000
7	County of Mariposa	Construct a septage collection and metering tank at the Lake Don Pedro Sewage Treatment Plant	$400,000
8	County of Mariposa	Repairs and upgrades to Lake Don Pedro Wastewater Treatment System	$2,200,000
9	County of Mariposa	Install back-up power at Mariposa Pines Sewage Treatment Plant	$225,000
10	County of Mariposa	Replace Water Distribution Piping in Coulterville	$1,480,000
11	County of Mariposa	Replace Sewage Collection Piping in Coulterville	$2,200,000
12	Economic Development Corporation	Mariposa Biomass / Biochar Facility	$5,000,000
13	Lake Don Pedro Community Services District	Lake McClure Deep Water Intake Feasibility Study	$30,000
14	Mariposa Public Utility District	Stockton Creek Watershed Fuel Modification Project	$240,000
15	Mariposa Public Utility District	Mariposa PUD Waste Water Treatment Facility Improvements	$7,300,000
16	Mariposa Public Utility District	Saxon Creek Pump Station Access and Ventilation System Improvements	$150,000
17	Merced Irrigation District	Lake McClure Area Recreation Enhancements	$332,300
18	Point Blue Conservation Science	Rangeland Watershed Initiative Partner Biologist	$180,000
19	Lake Don Pedro Community Services District	Dead End Main Replacement Project	$6,500,000
20	Lake Don Pedro Community Services District	Lake McClure Intake Improvement Project Phase III	$700,000

Project No.	Agency	Title	Total Project Cost
21	Lake Don Pedro Community Services District	Water Service Replacement Project	$3,750,000
22	Lake Don Pedro Community Services District	Treatment Plant Pump Replacement Project	$100,000
23	Lake Don Pedro Community Services District	New potable water well	$125,000
24	Upper Merced River Watershed Council (UMRWC)	Water Quality Monitoring Bioassessment in Upper Merced River Watershed	$25,000
25	Upper Merced River Watershed Council	Merced River Watershed Wildfire Fuel Reduction Project	$750,000
26	National Park Service/Yosemite National Park	Supplement Wawona Water System with Biledo Spring	$17,000,000
27	National Park Service/Yosemite National Park	Rehabilitate The Wawona Wastewater Treatment Plant	$24,000,000
28	Sierra Foothill Conservancy	Bean Creek Meadow Restoration	$372,000
29	Sierra Foothill Conservancy	Conservation Easement	$2,000,000
30	Sierra Foothill Conservancy	Conservation Planning, Phase 2	$50,000
31	Sierra Foothill Conservancy	Stockton Creek Preserve Expansion	$1,500,000
32	Ponderosa Basin Mutual Water Company (PBMWC)	Rural Water Company Infrastructure Rehabilitation	$600,000
33	Mariposa Resource Conservation District (MCRCD)	Invasive Plant Species education and eradication	$600,000
34	Mariposa Resource Conservation District	Drought Preparedness for Landowners and Residents	$86,250
35	Mariposa County Resource Conservation District	Water & Energy Efficiency Incentives Assistance Program	$645,000
36	Yosemite Area Audubon Society	Mariposa Creek Parkway Extensions	$932,000
37	Yosemite Alpine Community Services District	Water Meter Replacement	$50,000
38	Yosemite Alpine Community Services District	Drill well on Yosemite Mtn. Ranch TPZ and pipe water to NEW TANKS.	$500,000
39	USFS, Sierra National Forest, Bass Lake Ranger District	Sierra National Forest Bass Lake Ranger District Fuels Reduction Project - Rush Timber Sale, near Wawona	$1,733,000
40	USFS, Sierra National Forest, Bass Lake Ranger District	Sierra National Forest Bass Lake Ranger District Fuels Reduction Project - Hites-Feleciana Fuels Project , N of Mariposa Pines	$2,533,000

Project No.	Agency	Title	Total Project Cost
41	To be determined. Anticipate National Park Service, Yosemite National Park	Wawona Water Supply and Wastewater Treatment Projects	-*
42	American Indian Council of Mariposa County	Bear Creek Tribal Water Storage Project	$90,500
43	American Indian Council of Mariposa County	Mariposa Creek Native Plants Restoration and Education Project	$87,240
44	American Indian Council of Mariposa County	Invasive Plant Eradication/Native Plant Enhancement, Wawona, Yosemite NP	$81,200
45	Fish Camp Volunteer Fire Association	Drought/Fire Storage with additional wells with distribution pipelines and hydrants	$591,000
46	Mariposa Pines Water Company	Sounding Tube Installation	$2,500
47	Mariposa Pines Water Company	Tank 1 Replacement	$40,000
48	Mariposa Pines Water Company	Hazardous Tree and Brush Removal from Right-of-ways and Improvements	$160,000
49	Mariposa Pines Water Company	Install Power and Telephone Lines (for internet) to Water Tanks	$50,000
50	Mariposa County Resource Conservation District	Private Land Water Storage Improvement Assistance Project	$225,000
51	Mariposa Public Utility District (MPUD)	Waste Water Collection System Improvements	$3,924,000

* No project cost information provided.

As introduced above, the process to decide which projects to include in the Plan and how to prioritize them relied on evaluation of the project scoring criteria, technical judgment about the relevancy of the submitted projects, and project presentations. The projects, programs and management actions submitted by the stakeholders were compiled, reviewed, and scored by the PEC based on the information provided by the project proponents.

Impacts and Benefits (Section 8)

Section 8 provides an overview of the potential impacts and benefits associated with implementation of the Yosemite-Mariposa (Y-M) Region (Region) Integrated Region Water Management Plan (IRWM Plan). Because of the nature of the IRWM planning process, the impacts and benefits discussed here are preliminary and not intended to be a complete list; more extensive and project-specific evaluations of impacts and benefits usually occur through project implementation. This overview may be used as a guide for deeper consideration of, and response to, impacts and benefits encountered during Plan implementation. Later, as plan performance is evaluated, the Y-M Regional Water Management Group (RWMG) may utilize this preliminary assessment to better understand the benefits that have been realized and whether unanticipated impacts have occurred.

Some of the primary benefits from development of the Plan include the strengthened partnerships between local, State, Tribal and Federal entities that may not have happened otherwise. The Y-M IRWM planning process fosters coordination, collaboration and communication among the many entities in the Region that previously had no formal forum for regional collaboration on similar topics. The IRWM planning process is intended to result in greater efficiencies (e.g., efforts are not duplicated, information is shared), enhance public and environmental benefits, and encourage greater public support for projects that are important to sustainable water management.

Implementation of projects will also create lasting physical and institutional benefits throughout the region. While periodic updates and addition of projects will be needed over the 20-year horizon, implementation of the planned projects will produce multiple benefits including improved water quality protection, resource stewardship, reduction in catastrophic wildfire risk, improved water supply reliability, and improved water use efficiency.

Negative impacts that may be associated with the Plan projects include (1) short-term, site-specific impacts related to site grading and construction, and (2) long-term impacts associated with project operation. For the purposes of this Plan, impacts are discussed at a screening level below.

Implementation Framework (Section 9)

The Implementation Framework documents the relationships and decision-making structure recommended for use during the continued development and implementation of the Yosemite-Mariposa Integrated Regional Water Management Plan (IRWM Plan or Plan) over the next 20 years. It also sets forward a proposed framework for Plan implementation and guidelines for performance monitoring to track progress, and it offers suggested initial Plan implementation activities. This section is intended to define the entity (or entities) that will implement the Plan, the responsibilities for Plan implementation and therefore serve as the cornerstone of actions the Region must take to continue the IRWM program into the future.

Once the Yosemite-Mariposa IRWM Plan has been adopted, the focus of the RWAC (signatories to the MOU) and stakeholders will change significantly. Some of the activities conducted prior to and during Plan development will continue, but the emphasis will shift from planning toward implementation of projects and tracking of progress towards achievement of IRWM Plan objectives. Implementation of the Yosemite-Mariposa IRWM Plan will rely on actions taken by existing agencies and organizations within the Region, with the support of the IRWM governance structure.

The narrative that follows summarizes the overall activities of Plan implementation. Table 9-1 describes some of the specific roles and responsibilities and identities of the RWMG/RWAC member that would lead the activity. IRWM Plan implementation is not intended to interfere with or supersede actions taken by local agencies to fulfill the local agencies' authorized duties.

1) Public outreach and involvement processes -
   a) Establish Point of Contact for IRWM Program
   b) Maintain e-mail list
   c) Schedule and announce meetings
   d) Prepare agendas and content
   e) Facilitate meetings
   f) Prepare meeting summaries
   g) Administer website, and update content with meeting materials, and other relevant information

2) Balanced access and opportunity for participation in the IRWM process
   a) Monitor and maintain DAC and Tribal contacts list through notification prior to RWAC meetings

3) Effective Communications External to The Region
   a) Communication external to the Region
   b) Coordination with neighboring IRWM efforts – Sierra Water Work Group and Madera, Tuolumne-Stanislaus, Merced, Inyo-Mono Region IRWMs
   c) Coordination with state and federal agencies (e.g., RWQCB)

4) Long-term implementation of the IRWM Plan
   a) Evaluate Plan performance and monitoring for meeting objectives
   b) Review and act on objectives/targets not accounted for in projects
   c) Gather and synthesize data related to Plan projects and report to stakeholders
   d) Manage and share related data and information (also could be Data Management System)

5) Update Yosemite-Mariposa IRWM Plan
   a) Review and update objectives
   b) Solicit new or revised/integrated projects, provide project evaluation/scoring and regularly revise project and update project priorities, as needed or at a minimum of every 2 years
   c) Review/revise Plan content at least every 5 years

6) Financing Plan Implementation
    a) Evaluate IRWM Plan implementation administration (e.g. local staff in-kind contributions, and/or grants, or other financial sources)
    b) Communicate information on upcoming funding
    c) Improve project integration and select projects for inclusion in grant applications
    d) Prepare and submit grant applications

All organizations and individuals with an interest in improving water management in the Region are invited to participate in Plan implementation. The RWAC recognizes that a committed public outreach and notification process is a necessary task to ensure the public is aware that there are multiple opportunities to become involved in the program. Disadvantaged Communities and Tribes will continue to be an important aspect of outreach in the Region.

Decisions during implementation will continue to be made using consensus based agreement, as during Plan development with matters considered by the entire RWAC. If for some reason broad agreement cannot be reached by 100% of the active members of the RWAC present, within a reasonable amount of time and effort, the matter will be referred to the RWMG for final decision with both majority and minority positions represented. Active participation means that the member has had a representative or alternative in attendance at half or more of the RWAC meetings held within the last year.

Implementation of an IRWM Plan is an enormous undertaking and requires the financial contributions and attention of local, state, and federal agencies to ensure success. Financing of this Yosemite-Mariposa IRWM Plan involves two distinct tracks: funding of IRWM Plan administration through local in-kind staff time and coordination and funding of project implementation. This section highlights the anticipated funding needs for both tracks, identifies potential funding sources, and documents some of the activities that the RWAC and others could employ to secure additional funding. As of March 2014, fifty-one projects are included in the IRWM Plan. All of the projects provided funding information, with a total estimated funding need of $99 million. Of the fifty-one projects, several are projects currently at the early planning or feasibility study stage, which is an indicator that the overall funding needs may increase as these projects progress and are developed into implementable projects, programs, or actions, and as other projects are added to the IRWM Plan.

Although the RWAC is not intending to develop a Data Management System (DMS) to help retain, organize and process key Plan performance and monitoring data, opportunities to do so may be available in the near future as the Sierra Water Work Group is endeavoring to provide interregional data management for the IRWM's in the Sierra Nevada. A data management system provides a web-based geographic information system (GIS) platform which can be used to store and track information to support the Region's understanding of water management activities within the IRWM context. A DMS can assist in the success of Plan implementation, and whether adjustments to objectives, projects, or strategies may be needed in the future.

Coordination (Section 10)

As described in previous sections of this IRWM Plan, management of water and related resources within the Yosemite-Mariposa Region (Region) is complex and has many interdependencies. Several stakeholder groups both have authorities and responsibilities for managing water and related resources within the Region. This complexity and the distributed network of shared responsibilities create the need for robust and effective coordination. This

section describes how the Region intends to continue to coordinate with neighboring IRWM regions and local, state, and federal agencies as well as other stakeholders both within and outside of the Region to improve integrated water management.

The primary benefit of this IRWM Plan is the development of a shared vision and objectives for regional water management and planning among the stakeholders both within and outside of the Region and a framework for maintaining that into the future. The process of developing this IRWM Plan has fostered improved coordination, collaboration, and communication among stakeholders, and a greater awareness of concerns throughout the Region.

A collaborative approach to water management is essential to meeting the Region's goals. Several projects included in this Plan, as described in Section 7, involve multiple agencies or organizations, which reinforces the need for collaboration to achieve efficient project execution. Several of the local water management agencies such as Mariposa County, Fish Camp Fire and Rescue, Yosemite Alpine Community Services District within the Region have developed cooperative relationships and processes for coordination with each other and with other local organizations.

Coordination with state and federal agencies has occurred during the initial formation of the Region and during Plan preparation. In the future, coordination with these agencies will occur on an as-needed basis for planning and implementation of specific projects and during future Plan updates.

Beyond the need for internal coordination, the Region also recognizes the importance of coordination with other nearby IRWM planning regions. Appropriate coordination among regions and agencies can help leverage shared activities, identify opportunities for cooperative projects, and reduce potential conflicts among IRWM projects. The Region is bounded by several neighboring IRWM regions, and is one of twelve IRWM regions in the San Joaquin funding area. The Sacramento funding area borders the Region to the North, the North/South Lahontan funding area borders the Region to the east, and the Tulare/Kern funding area borders the Region to the South.

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Section 1: Introduction

1.1 Introduction

The Integrated Regional Water Management Plan (IRWM Plan) defines a clear vision of the management of water resources in the Yosemite-Mariposa Region (Region) and highlights important actions needed to help accomplish that vision through the year 2035. The Yosemite-Mariposa (Y-M) IRWM Plan is a volunteer, collaborative effort by local agencies, organizations and residents to develop strategies to manage the water resources within the Region. The purpose is to meet long-term water needs. The plan will provide a way for the region to acquire funding to complete projects that address water quality, water supply, safe drinking water, water reliability, flood and stormwater management and ecosystem protections. This IRWM Plan is intended to be an integrated planning tool in compliance with the *Integrated Regional Water Management Guidelines for Proposition 84 and 1E* published by the California Department of Water Resources (DWR) in November 2012. This planning tool will help bring stakeholders together for the foreseeable future and identify, plan, and execute actions to better manage water in the Region and to accomplish more than agencies and organizations could do individually.

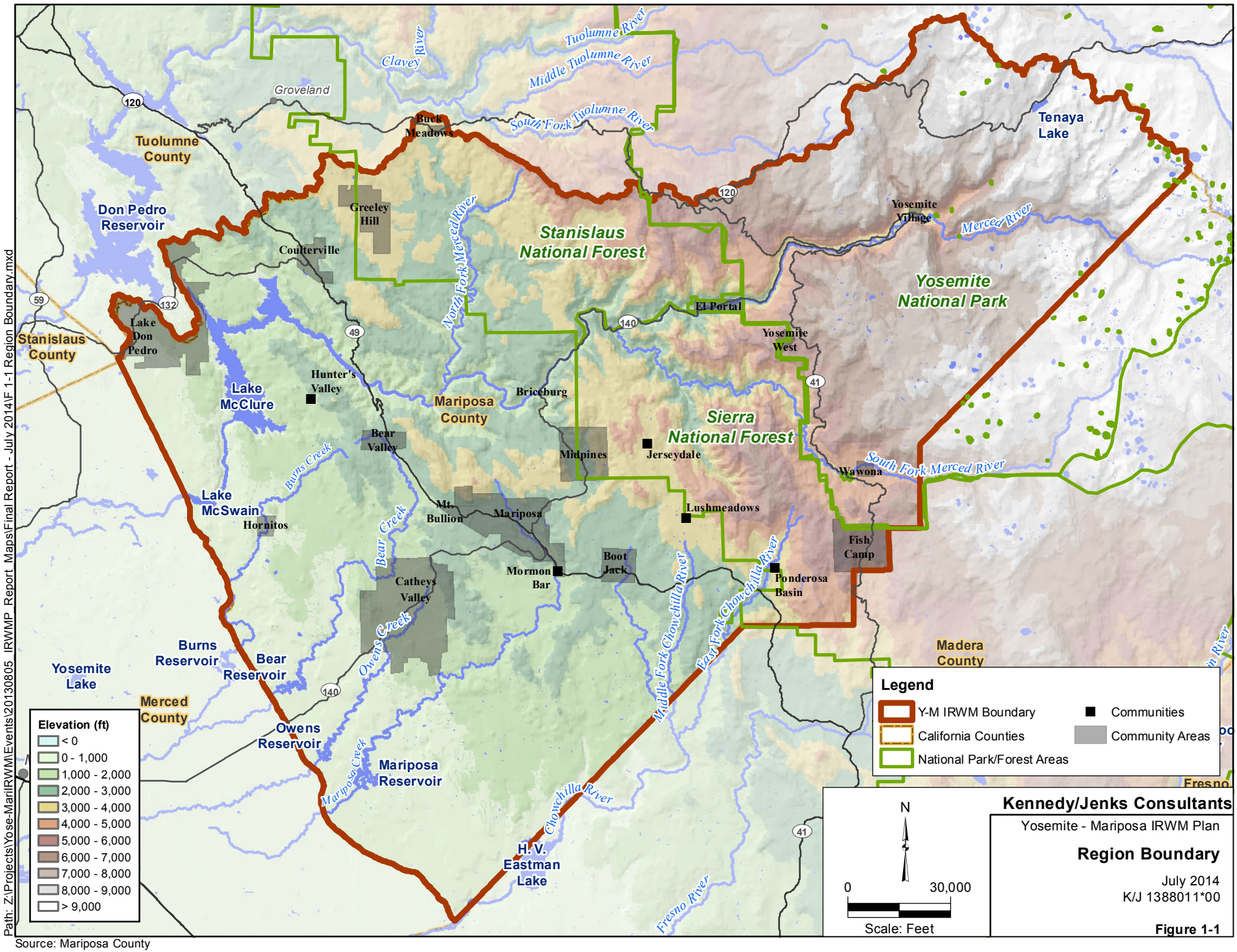
Efforts to compile this plan have taken multiple years and the time and resources of more than 20 water purveyors; local, state and federal agencies; natural resources advocates, and other stakeholders. The effort has resulted in an opportunity to accomplish much more than any one agency could have achieved and has fostered better stewardship of resources throughout the planning horizon. This compilation of integrated goals, objectives, background, resource management strategies, and projects is the product of input gathered from stakeholder involvement, public contributions, research, and technical studies and is custom tailored to meet the needs of the Region.

1.2 Background

1.2.1 Regional Features

Foothills in the Y-M Region
Credit: Kristen Boysen, Sierra Foothill Conservancy

The Region is located on the western slope of the Sierra Nevada Mountain range entirely in Mariposa County, California bordering the Central Valley as shown on Figure 1-1. The Region has a varied terrain from rolling foothills in the western portion of the Region to rugged mountainous terrain in the east with a land area of about 1,461 square miles (935,228 acres). The Region encompasses much of the high Sierra headwaters of the Merced River which are in Yosemite National Park as well as the foothill watersheds of the lower Mariposa County and the Fresno-Chowchilla River many of which are in the Stanislaus or Sierra National Forests. There are numerous alpine lakes and several man-made reservoirs throughout the watershed, including Lake McCLure and Lake McSwain on the Merced River and Bear, Owens, and Mariposa Reservoirs in the Lower Mariposa County group of streams. Despite the significant water and natural resources, the Region is a sparsely populated area with a total population of about 18,000 with no incorporated cities. Larger communities in the Region include Mariposa, El Portal, Yosemite Village, and Wawona as well as smaller communities such as Catheys Valley, Coulterville, Fish Camp and Midpines. A more detailed description of the Region is found in Section 2.



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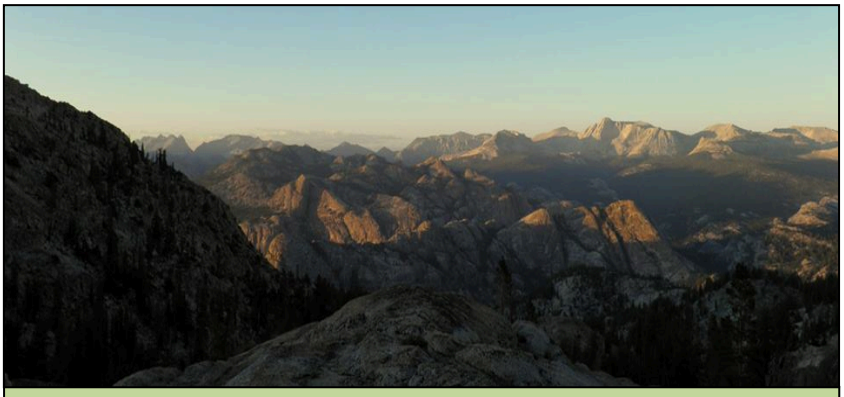
Source: Mariposa County

1.2.2 Primary Goals for the IRWM Plan

This IRWM Plan is the first regional watershed-management plan of its kind in the Y-M Region. Its intent is to address the many major water-related needs/challenges and conflicts within the Region, including water quality, local water supply reliability, and better integration of water and land use management, fuel management for wildfire prevention and resource stewardship and ecosystem protection.

The Y-M Region's landscape is predominantly made up of large forested areas, including 53% of the Region which is managed by Yosemite National Park, the Bureau of Land Management, and the U.S. Forest Service (Sierra and Stanislaus National Forests). Although the Region does not have a large population, the Merced River watershed, which is about 64% of the Region is a major tributary to the San Joaquin River, which combines with other Delta tributaries to provide water for millions of people in the San Joaquin Valley and Bay Area, and water for irrigating hundreds of thousands of acres of prime farmland. Therefore, the protection of the river's many beneficial uses and improvement of water quality is essential to both aquatic ecosystems and human health. Groundwater wells also provide the only source of domestic and municipal supplies for the majority of the residents in the Region, about half of whom are on private wells. For these reasons, preserving and improving surface and groundwater quality in the Region has been identified by stakeholders as a key topic to the continued viability of water resources. Issues such as sediment erosion, mercury contamination, and bacterial contamination are regional water quality concerns addressed in this IRWM Plan.



Sierra Crest Sunset
Credit: Kristen Boysen, Sierra Foothill Conservancy

Water within the Region is supplied mostly from groundwater wells with a limited quantity of surface water diversions. Improvement of water supply sources, reliability, quality, and distribution within disadvantaged communities (DAC) and urban areas is an ongoing need. There are several water systems in the Region that rely on a single source of water supply that put the communities at risk if that source becomes unavailable. The water agencies of the Region continuously strive to improve water supply reliability and quality.

Catastrophic disruptions to the Region's water resources can result from natural disturbances such as fire, and occasionally flooding, and the risk of these disturbances is influenced in part by land use management decisions. Land use decisions must also be balanced with the limited availability of supply, and the risk to water quality some developments can cause – particularly those that rely on onsite wastewater treatment (septic) systems.

Many opportunities exist to improve the general public's understanding of their role in the protection of the Region's water and natural resources. Many individuals and organizations throughout the Region that are interested in the water resource management are already engaged in efforts that support the work of water management entities. However, more can be done to develop and implement broader public education efforts to both local residents as well as

the approximately 4 million visitors per year to further improve stewardship of the Region's precious water resources.

The Region provides hundreds of square miles of habitat for countless species, including a broad range of terrestrial and aquatic, and over 50 state and federally recognized special-status and endangered species including the foothill yellow-legged frog, Yosemite toad, and western pond turtle. Improvement of aquatic and terrestrial habitat to promote the survival, restoration, and growth for these important species, and many others is critical as is to the eradication of invasive species.

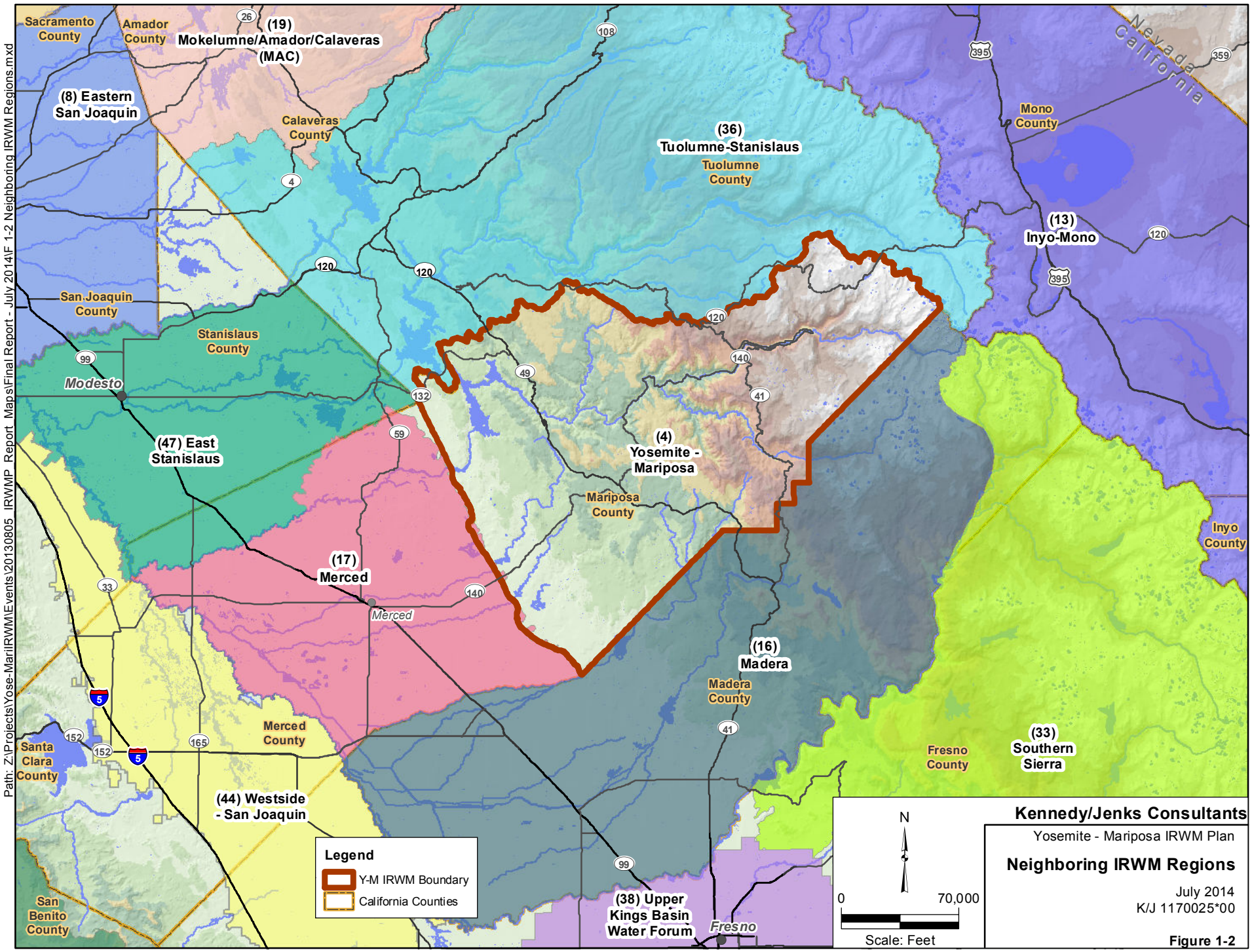
The Region provides an important flood management function as well, since several of the reservoirs, especially in the Mariposa County group of streams watershed, provide important flood protection for large cities downstream in the San Joaquin Valley. Other important issues included in the Plan are: improving efficiency of water systems, water conservation, better management of wastewater discharge/disposal, increasing renewable energy production, and addressing potential local flooding. Many of these topics can be linked to the need to understand the effects climate change may have on these predominately snow-fed surface water systems.

The primary goals of the plan were developed after extensive stakeholder interaction as described in Section 5, and include the following:

- Goal #1: Provide/Improve Reliable Water Supply within the Region
- Goal #2: Ensure Reliable Community Water and Wastewater Infrastructure
- Goal #3: Maintain or Improve Water Quality in the Region
- Goal #4: Protect and Improve Wildlife Habitat
- Goal #5: Assess and Enhance Recreational Opportunities in the Region
- Goal #6: Develop Collaborative and Sustainable Partnerships Both Within and in Adjacent Regions
- Goal #7: Reduce Risk of Catastrophic Fire
- Goal #8: Educate Stakeholders and County Residents about Water Issues through the IRWM Process to Inspire Public Action
- Goal #9: Prepare for Impacts of Climate Change

1.2.3 Formation of the Yosemite-Mariposa IRWM Region

The formation of the Yosemite-Mariposa Region began with the larger CenCal Region that includes a group of stakeholders located in the central portion of California. This Region was submitted in response to the original Proposition 84 Integrated Regional Watershed Management Plan guidelines for the Regional Acceptance Process (RAP). The Mariposa County Resource Conservation District (MCRCD) was the lead agency of the RAP process. The CenCal Region was conditionally accepted during the first RAP round. In a later meeting on July 7, 2010 between DWR, CenCal IRWM, Merced IRWM, and Madera IRWM, the boundary of the CenCal IRWM Region was revised so as to not overlap with neighboring regions and was renamed the Y-M Region. Following the change, the Y-M Region boundary is coincident with the Mariposa County line after the change and is bounded on all sides by other IRWM regions as shown on Figure 1-2. As noted earlier, Yosemite National Park, and the Sierra and Stanislaus National Forests overlap with the Y-M Region and other IRWM regions.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Sacramento County
Amador County
(19) Mokelumne/Amador/Calaveras (MAC)
(8) Eastern San Joaquin
Calaveras County
(36) Tuolumne-Stanislaus
Tuolumne County
Mono County
Nevada
California
(13) Inyo-Mono
San Joaquin County
Stanislaus County
Modesto
(47) East Stanislaus
(4) Yosemite - Mariposa
Mariposa County
(17) Merced
Merced
(16) Madera
Madera County
Inyo County
Merced County
Santa Clara County
(44) Westside - San Joaquin
Fresno County
(33) Southern Sierra
San Benito County
(38) Upper Kings Basin Water Forum
Fresno
Legend
Y-M IRWM Boundary
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Scale: Feet
Kennedy/Jenks Consultants
Yosemite - Mariposa IRWM Plan
Neighboring IRWM Regions
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Figure 1-2

1.3 Governance

The governance of the Y-M IRWM includes both a Regional Water Management Group (RWMG) of 5 entities and a broader Regional Water Advisory Council (RWAC) of community representatives who are signatories to a Memorandum of Understanding (MOU) found in Appendix 1-A. In addition there are Agency Partners who are non-voting members of the RWAC. The RWMG and RWAC are described as follows.

1.3.1 Regional Water Management Group

The five entities that comprise the RWMG include Mariposa County Resource Conservation District (fiscal lead agency and resource management entity), Mariposa County Water Agency (Land Use), Mariposa Public Utility District (water purveyor), Lake Don Pedro Community Services District (water purveyor) and Upper Merced River Watershed Council (non-governmental organization). In accordance with the MOU, the RWMG provides overall direction, funding and approval for the IRWM planning process and work products.

1.3.2 Regional Water Advisory Council

The RWAC is comprised of community representatives who are signatories to the MOU. Their role is to identify regional water-management issues and needs; establish goals and objectives, plans and projects, and future funding and governance. The RWAC also conducts outreach and involvement activities to inform and solicit input from the community. In addition to RWAC members, the RWAC has established partners, who are non-voting members who are not signatory to the MOU, but wish to be involved in the IRWM process. Table 1-1 provides the current list of RWAC members and partners. This table also indicates whether they are a member of the RWMG as well as if they have statutory authority over water supply or water management. DWR requires that at least two members of the RWMG include agencies with statutory authority.

Members of the public, non-member community organizations and other interested stakeholders are welcome to attend RWAC meetings and provide input during the public comment period of the meeting.

Table 1-1: RWAC Members

Agency/Organization	Organization Type	Statutory Authority for Water Management	RWMG Member
Economic Development Corporation of Mariposa County (EDC)	Corporation		
Fish Camp Fire/Rescue Association	Non-profit Corporation		
Lake Don Pedro Community Services District (LDPCSD)	Community Services District	X	X
Mariposa County Water Agency	Land Use Authority	X	X
Mariposa County Resource Conservation District (MCRCD)	Special District		X
Mariposa Pines Mutual Water Company	Mutual Water Company		
Mariposa Public Utility District (MPUD)	Special District/Public Utility	X	X
Mariposans for the Environment and Responsible Government (MERG)	Environmental Stewardship, Non-Profit		
Merced Irrigation District (Merced ID)	Special District	X	
Ponderosa Basin Mutual Water Company (PBMWC)	Mutual Water Company		
Sierra Foothill Conservancy (SFC)	Land Conservancy		
Upper Merced River Watershed Council (UMRWC)	Environmental Stewardship, Non-Profit		X
Yosemite Alpine Community Services District (YACSD)	Community Services District		
Yosemite Area Audubon Society (YAAS)	Environmental Stewardship, Non-Profit		
	PARTNERS		
Mariposa County Water Agency Advisory Board	Advisory Board		
Central Sierra Watershed Committee	Environmental Stewardship, Non-Profit		

1.4 Stakeholder Coordination and Outreach

1.4.1 Overview of the Stakeholder Coordination and Outreach Process

Inclusion of stakeholders and a consensus-driven process have been cornerstones to the work throughout the Y-M IRWM Plan development process. Extensive stakeholder outreach was conducted to help ensure that the Plan reflects the water-related needs of the entire Region, promotes the formation of regional partnerships, and encourages increased coordination with state and federal agencies. The term stakeholders is used to refer to representatives of agencies, NGOs, nonprofit groups, governmental organizations and the public who were interested and participated in the development of the IRWM Plan.

Y-M IRWM Plan Meeting
Credit: Pat Garcia

A benefit of the IRWM process is that it brings together a broad array of groups into a forum to discuss and better understand shared needs and opportunities. Members of the RWAC and other stakeholders participated in monthly stakeholder meetings, reviewed meeting materials that included handout materials prepared to discuss plan content, draft IRWM Plan sections, and provided extensive collaborative input to shape this IRWM Plan. In addition, through participation in meetings, stakeholders have been exposed to a variety of opportunities for discovering and establishing mutually beneficial partnerships.

Stakeholder coordination and outreach were initiated for several years prior to the preparation of the IRWM Plan and has been a continual process throughput plan development. A summary of meetings associated with the Y-M IRWM Plan is summarized in Table 1-2 and meeting summaries are included in Appendix 1-B. Outreach was managed and coordinated by the Public Outreach Committee (POC) made up of stakeholder volunteers who met on a regular basis. Outreach in the Region was a challenge due to the dispersed population, but efforts were made to connect with many residents by attending community meetings throughout the County. The public was also invited to attend RWAC meetings held in Mariposa.

Table 1-2: Summary of Yosemite-Mariposa Meetings

Meeting No.	Date	Key Topics	No. of Attendees
Summary of Development Work by the RWMG	June 29, 2011 Nov. 28, 2012	14 RWMG meetings and 17 sub-committee meetings were held to develop Planning Grant and Facilitation Support Services applications, governance and interregional MOUs, review and refine objectives, discuss potential water studies and public/DAC outreach, align project concepts with statewide priorities and hear presentations from member agencies and educational speakers. Meeting facilitation training classes were also held.	RWMG Avg. =17 Sub-com Avg. =7
1	12/6/2012	Governance-Updated MOU Adopted	14
2	1/24/2013	Application Update, Public Outreach, Invoicing	17
3	3/27/2013	Climate Change, Public Outreach Plan	20
4	5/22/2013	DWR Agreement, Outreach, Governance	23
5	6/26/2013	Regional Goals, Public Outreach	21
6	7/24/2013	Objectives, Outreach, Contracts	29
7	8/28/2013	Objectives, Region Description	23
8	9/25/2013	Objectives, RMS, Table of Contents, Region Description	24
9	10/23/2013	Region Description, Relation to Local Land Use Planning, Relation to Local Water Planning	27
10	12/4/2013	Outreach, Objectives Prioritization, Existing & Future Conditions, Project Selection Criteria	38
11	1/22/2014	Technical Studies, RMS, Project Selection Criteria Process	38
12	2/26/2014	Call for Projects, Climate Change Vulnerability, Region Description, Goals & Objectives, RMS	36
13	3/26/2014	Project Presentations, Project Evaluation Process	35
14	4/23/2014	Climate Change, Project Evaluation Process, Drought Funding, Future Governance	33
15	5/28/2014	Drought Funding, Future Governance, Accelerated Plan Schedule	19
16	6/25/2014	IRWM Plan Process Overview and Plan and MOU Adoption Process	20

1.4.2 Stakeholders

A list of all of the agencies and organizations that were involved in the development of the Y-M IRWM Plan is provided in Table 1-3. The broad array of stakeholders includes the agencies that constitute the RWAC, as well as an extensive mix of regulatory, environmental, tribal and land use planning entities that represent all areas of the Y-M Region including:

- Municipal and County Governments
- Wholesale and Retail Water Purveyors, Wastewater Agencies, and Special Districts
- State and Federal Regulatory and Resource Agencies
- Environmental Community
- Tribal Community
- Disadvantaged Community
- Others

Table 1-3: Participating Stakeholders

County Governments	Tribal Community
Mariposa County	American Indian Council of Mariposa

Wholesale and Retail Water Purveyors, Wastewater Agencies, and Special Districts	State and Federal Resource Agencies
Mariposa Public Utilities District (MPUD)	National Park Service (NPS)
Mariposa County Water Agency	United States Forest Service (USFS)
Yosemite Alpine Community Services District (YACSD)	Bureau of Land Management (BLM)
Yosemite West Maintenance District	USDA Natural Resources Conservation Service
Mariposa Pines Mutual Water Company	Department of Water Resources (DWR)
Merced Irrigation District (Merced ID)	Cal Fire
Ponderosa Basin Mutual Water Company (PBMWC)	Office of Emergency Services-Mariposa County
Mariposa Co. Resource Conservation District (MCRCD)	Department of Fish and Wildlife
Lake Don Pedro Community Services District (LDPCSD)	

Environmental Community	Disadvantaged Community
Mariposans for the Environment & Responsible Govt. (MERG)	Catheys Valley
Sierra Foothill Conservancy (SFC)	Coulterville
Upper Merced River Watershed Council (UMRWC)	Fish Camp
Yosemite Area Audubon Society (YAAS)	Greeley Hill
Point Blue Conservation Science	Hornitos
Sierra Club Tehipite Chapter	Midpines
	Mariposa

Other	
Fish Camp Fire Rescue Association	Mariposa County Fire Safe Council
Economic Development Corp of Mariposa County (EDC)	Inyo-Mono IRWMP
Madera RWMG	Mariposa County Water Agency Advisory Board
Merced Regional Advisory Council	Wawona Area Property Owners Association
Mariposa County Fire Department	Wawona Town Planning Advisory Committee
Sierra Water Workgroup	Central Sierra Watershed Committee
	Merced Regional Advisory Council

1.4.2.1 County Governments

Mariposa County is the only county in the Region. County staff and several county supervisors participated in the IRWM Plan process through the identification of issues, information on local public health and land use and planning activities, formation of objectives, development of projects and discussion in meetings. The County also helped to initiate the IRWM process for the Region and continued to play a part throughout the plan development.

1.4.2.2 Wholesale and Retail Water Purveyors, Wastewater Agencies, and Special Districts

The participation of agencies with water management including water purveyors and wastewater collection focus was particularly important to the IRWM Plan process as some of the greatest needs in the Region are associated with infrastructure to serve many of the County's residents.

1.4.2.3 State and Federal Regulatory Resource Agencies

With the majority of the Region being forested lands, the regulatory agencies play a key part in the integration of the plan. Federal agencies manage a large portion of these forest lands, while state agencies and districts, such as CAL FIRE and local fire entities are integral in the protection of the citizens in the privately held forest lands.

1.4.2.4 Environmental Community

Several of the stakeholder organizations exist to protect, analyze, or monitor the natural environment against misuse or degradation from human interaction and natural disasters such as wildfires. These organizations are part of the local environmental community and play a role in the planning process in order to minimize the impact of development decisions and to advocate for and implement watershed restoration activities.

1.4.2.5 Tribal Community

While there is one tribal community, the Southern Sierra Miwok Nation, currently centered in the Region, there are several others such as the North Fork Mono Tribe and the Picayune Rancheria of the Chukchansi Indians, whose peoples have cultural ties to the Region but are now centered elsewhere. Together, these tribes have a long and rich cultural history that is rooted in the Region.

1.4.2.6 Disadvantaged Community (DAC)

As described in greater detail in Section 2, the majority of the Region, outside of Yosemite National Park, is economically disadvantaged (i.e., has a median household income (MHI) less than 80% of the statewide MHI) which has posed challenges for planning and opportunities to provide assistance through the IRWM process.

1.4.2.7 Others

Other entities involved in the planning process were representatives from Fish Camp Fire Rescue Association, Mariposa County Fire Safe Council, and Wawona Area Property Owners Association as well as representatives from adjacent IRWM Plans. Several private citizens with interests in water and resource management were also in regular attendance.

1.4.3 Community Outreach Overview

The planning process included community outreach focused on building involvement and interest for a wide variety of stakeholders to recognize the diverse regional and local interests. The planning process centered on public stakeholder meetings. Stakeholders were invited to participate through facilitated discussions and review of draft documents; the meetings were announced to a broad distribution list via e-mailed invitations. All meeting materials were made available on the website after each meeting.

Public outreach activities occurring throughout the process included:

- Stakeholder Meetings – As summarized in Table 1-2, over 15 stakeholder meetings were held prior to the preparation of the IRWM Plan and an additional 15 meetings were held throughout the IRWM process. These meetings provided background on the planning process, facilitated development of Plan goals and objectives, considered opportunities for coordination among local and regional agencies, presented Plan sections to provide opportunity for comments on Plan sections, identified potential projects, and discussed project selection criteria, as well as Plan governance. In addition to the monthly RWAC

meetings, community outreach at meetings within the Y-M Region was headed by the public outreach committee.

- Informational Brochure – A brochure was mailed to all residents in the Region to provide information about the IRWM process, how to participate, and the groundwater sampling program open to residents.

- Review of Plan Sections – The sections of the IRWM were drafted incrementally and provided to stakeholders for review and input at multiple points during the Plan development process. Materials were accepted and finalized only after the stakeholders reached consensus.

- Website – The Y-M website (http://www.mcrcd.net/Pages/IRWMP.aspx) was published on part of MCRCD's website. As noted previously, handouts distributed at each stakeholder meeting were posted on the website after each meeting. Additional information regarding the IRWM Plan was also posted to this webpage.

- Electronic and Written Communication – Email was the main tool used to maintain stakeholder communication and engagement. The email list, which contained approximately 100 entries, was used to invite stakeholders to the meetings and provide materials for review.

- Contact Information – Consultant contact and MCRCD staff contact information were made available to any stakeholder or interested party to ask questions about the IRWM Plan and to receive feedback.

- Notices to Prepare and Adopt the IRWM Plan – Notices to Prepare and Adopt the IRWM Plan were published in accordance with Government Code §6066 in the local newspaper the Mariposa Gazette and are found in Appendix 1-C.

1.4.3.1 Disadvantaged Communities Outreach

A special effort during the IRWM Plan process was made to include DACs by making presentations at meetings of community groups. A significant portion of the Region qualifies as a DAC but is sometimes hard to contact due to the sparse population. Although no organizations specifically addressing Environmental Justice (EJ) concerns have been identified in the Region, opportunities to address EJ issues were coordinated with DAC outreach as appropriate.

1.4.3.2 Tribal Outreach

Consistent with the 2009 Update to the California Water Plan, the Y-M RWMG has used the term "California Native American Tribe" to signify all indigenous communities of California including those that are not federally recognized. The purpose of tribal outreach as part of the IRWM plan was to engage and identify issues and ultimately projects specific to water resources that would benefit each tribe. Early in the project, the California Native American Heritage Commission was contacted to provide information and participate in the planning process. Contact was made with fourteen individuals, most of whom were with the American Indian Council of Mariposa County and North Fork Rancheria. Representatives of these groups participated in meetings to gather information and identify projects beneficial to the tribes. Three tribal projects are included in the IRWM Plan.

1.4.4 Neighboring IRWM Regions

Given the Y-M Region's location in the California Sierra Nevada mountain range and extending to the Central Valley, it shares significant water resources with the surrounding regions. The Y-M Region is bounded by four regions: East Stanislaus, Merced, Madera, and Tuolumne-Stanislaus as shown on Figure 1-2. The Tuolumne-Stanislaus Region shares Yosemite National Park, a significant resource for both Regions. The Madera IRWM Region shares a portion of the headwaters of the Merced River watershed as well as some of the smaller water features with the southeastern portion of the Y-M Region. The Y-M Region is most interconnected with the Merced IRWM Region, which relies on the Merced River watershed for the bulk of its water supplies.

1.5 Plan Development

The IRWM Plan development process was organized around monthly stakeholder meetings. The topics and plan sections were introduced and discussed during the meetings. Stakeholders were provided the opportunity to review the content and sections prior to the meetings and submit written comments after the meetings. Content was then drafted and finalized by a consultant team led by Kennedy/Jenks Consultants.

The key topics discussed during the Plan development process are outlined in Figure 1-3. These topics consist of content items defined in DWR's published standards for IRWM Plans (see Proposition 84 and Proposition 1E Integrated Regional Water Management Grant Program Guidelines; November 2012). Although not specifically highlighted in Figure 1-3, the IRWM Plan Standards for stakeholder involvement and coordination were a key topic addressed throughout the process, as described in Section 1.4.

IRWM Plan development was iterative as plan content was prepared based on the discussion of each topic and then was provided for public review and comment. The draft content was discussed at the meeting and then revised through an iterative process based on comments received by the stakeholders until consensus was reached. As described below, a Plan Review Committee was convened on an as needed basis to assist in refining content and resolving any conflicting comments. At the end of the planning process, the agreed upon content was synthesized into this IRWM Plan for final public review and RWMG member adoption.

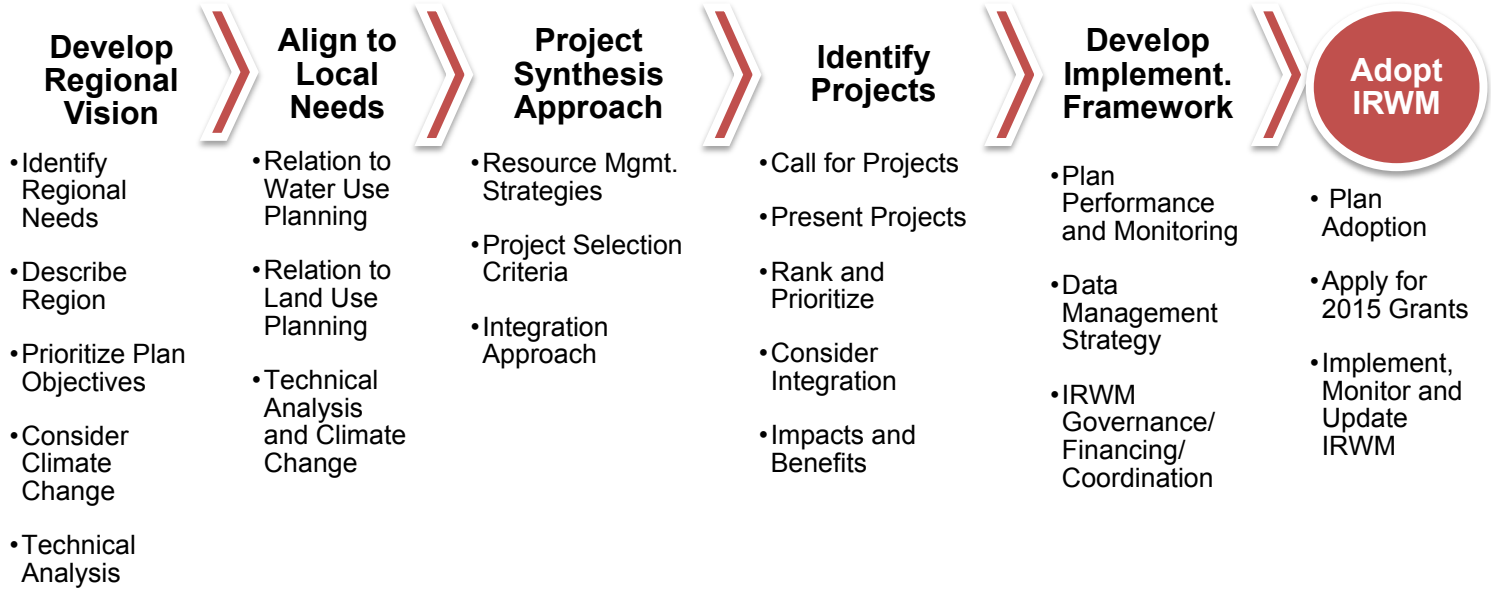

Figure 1-3: IRWM Planning Process Overview

1.5.1 Subcommittees

Subcommittees were formed during the process of developing the plan to allow for a more in-depth discussion of certain topics. These specialized committees focused on a single topic and were able to work more efficiently than in the large group setting. The committees met on a regular basis to participate and assist staff and consultants in matters that required more extensive stakeholder feedback. The subcommittees formed during the planning process are listed in Table 1-4.

Table 1-4: IRWM Plan Committee Participating Agencies

IRWM Plan Subcommittee Topic	Participating Agencies
Steering	Mariposa County Water Agency, MCRCD, MPUD, Sierra Nevada Conservancy (SNC)
Request for Proposals (RFP)	Mariposa County Water Agency, MCRCD, MPUD, MERG, Fire Safe Council, SNC
RFP Vendor Conference	LDPCSD, MPUD, MCRCD, Mariposa County, Mariposa County Water Agency Advisory Board, Mariposa Fire Safe Council, MERG, UMRWC, SNC
RFP Selection	MCRCD, MPUD, Mariposa County Water Agency, MERG, Water Agency Advisory Board
Application Review	MCRCD, MPUD, Mariposa County Water Agency, UMRWC, Merced ID, SNC
Objectives	MPUD, Merced ID, Sierra Foothill Conservancy (SFC), Fish Camp Fire Rescue Association, Yosemite Area Audubon Society
Public Outreach	Mariposa County Water Agency Advisory Board, Upper Merced River Watershed Council (UMRWC), Mariposans for Environmentally Responsible Government (MERG)
Project Evaluation	Mariposa County Water Agency, MPUD, MERG, SFC, MCRCD, UMRWC
Plan Review	All Member Agencies and Organizations

1.5.2 Plan Organization

The Region IRWM Plan is organized as a narrative, telling the story of the water-related conflicts, challenges and opportunities and how they shape the Region's goals and objectives. The Plan includes all elements required by the IRWM guidelines but has slightly different section headings to better fit the Region.

Table 1-5: Proposition 84 Required Elements Included in the Plan

IRWM Standard	Primary IRWM Plan Section
A. Governance	1, 9
B. Region Description	2, 3
C. Objectives	5
D. Resource Management Strategies (RMS)	6
E. Integration	7
F. Project Review Process	7
G. Impact and Benefit	8
H. Plan Performance and Monitoring	9
I. Data Management	9
J. Finance	9
K. Technical Analysis	3, Appendix 3-B & C
L. Relation to Local Water Planning	4
M. Relation to Local Land Use Planning	4
N. Stakeholder Involvement	1
O. Coordination	10
P. Climate Change	2,3

1.6 Plan Adoption

The IRWM plan will be adopted by the RWMG and any project proponents seeking IRWM program grant funding. An effort will be made to have the plan adopted by all participants in the planning process, including each of the RWAC members. It is currently anticipated that the plan adoption will begin once the final IRWM plan has been released in the summer of 2014. Additional information regarding the Plan adoption process and recommendations will be provided in later sections.

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Section 2: Region Description

2.1 Introduction

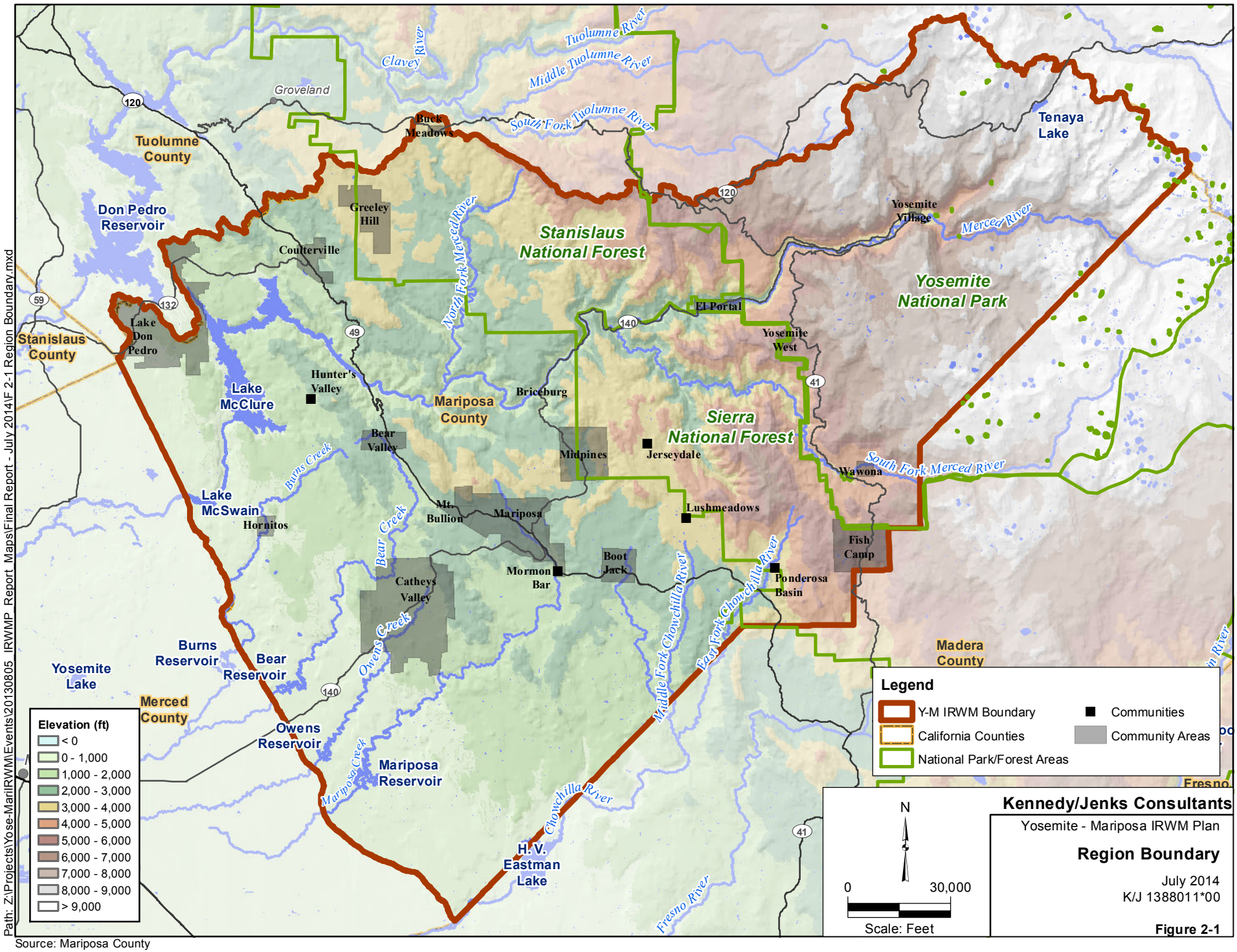
Section 2 that follows focuses on many of the facts of the Yosemite-Mariposa Region (Y-M Region, Region) such as climate data, population, socioeconomics, geographic features, and hydrologic boundaries. When combined with Section 3: Existing and Future Conditions, both sections collectively address the IRWM Plan Guidelines of Proposition 84 for the Region Description standard.

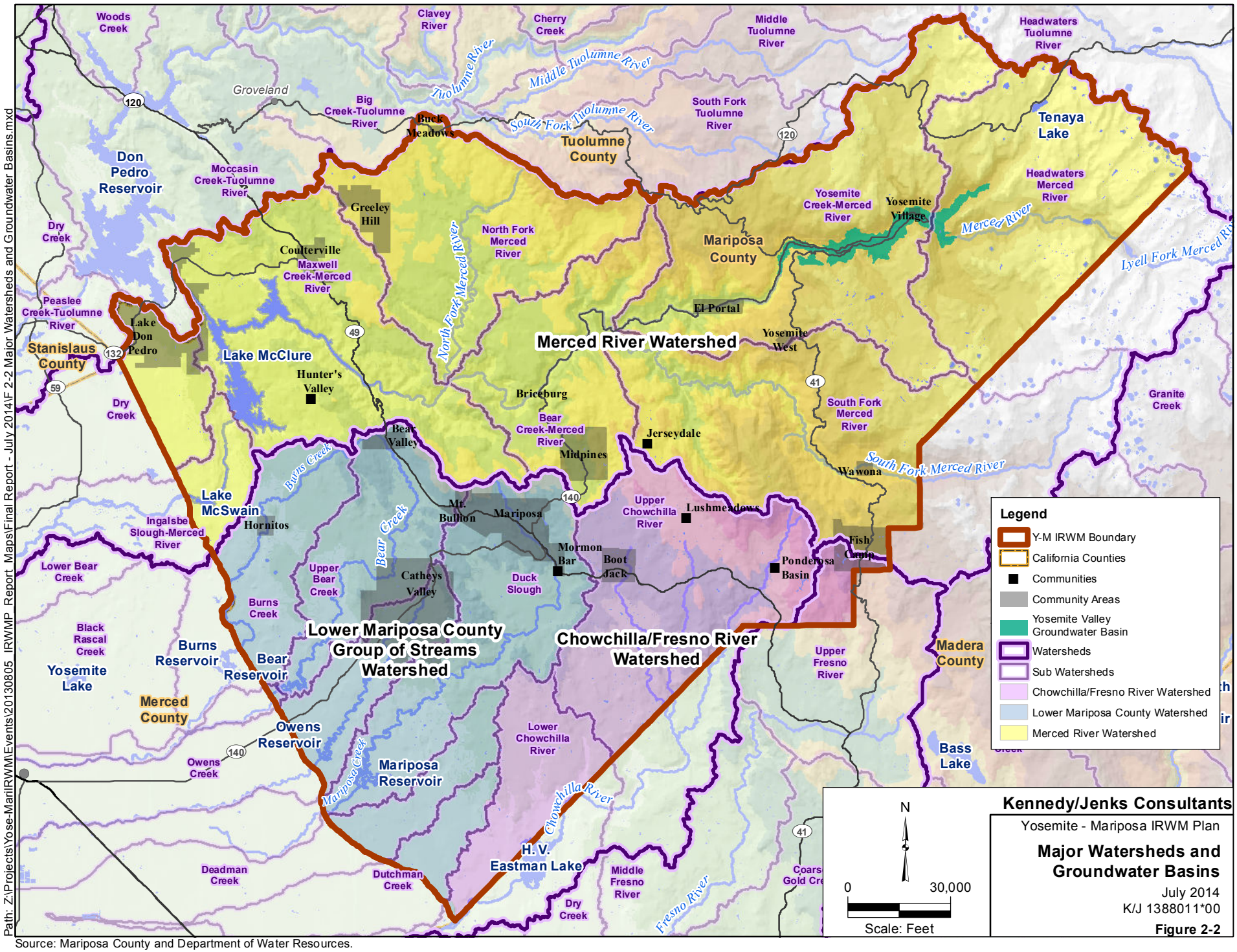
This section describes the Region, focusing on the natural and manmade features that relate to the water and environmental resources. As it is impossible to describe in detail a vast region the size of Yosemite-Mariposa in just a few pages, this section introduces the many resources of the Region, and provides context for understanding many aspects of the Plan. For example, the depictions of water-related challenges and opportunities (presented in Sections 2 and 3) are designed to correlate with the objectives in subsequent sections. In this way the Plan incrementally builds an overall understanding of the Region's water management actions that will contribute towards addressing challenges and opportunities introduced in these initial sections.

2.2 Region Overview

Cascades, Winter Riverbank
Credit: Dan Horner

The Y-M Region encompasses the entirety of Mariposa County, located in central California, adjacent to the San Joaquin Valley and is part of the historic Mother Lode region along the western slope of the central Sierra Nevada Mountains. The Y-M Region spans from forested National Park and National Forested lands to rolling oak woodlands in the foothill areas. The vast area and history bring unique physical characteristics and land ownership/management, but are brought together through their common linkage in sharing forests and waterways. Terrain varies throughout the Region from granite peaks exceeding 11,000 feet in the east to grasslands below 1,000 feet at the western border of the Region. Variation throughout the middle of the Region includes conifer forests, glacially carved valleys, mountain meadows, and oak woodlands. The impact of glaciation and water erosion throughout Yosemite National Park and Yosemite Valley have created the remarkable valleys, mountain meadows and other physical features for which the Region is renowned. The Region boundaries, topography, and key physical features are shown on Figure 2-1, with the hydrologic watershed boundaries and groundwater basins depicted on Figure 2-2.


Tuolumne County
Stanislaus County
Merced County
Mariposa County
Madera County
Fresno
Groveland
Buck Meadows
Greeley Hill
Coulterville
Hunter's Valley
Bear Valley
Briceburg
Midpines
Jerseydale
Mt. Bullion
Mariposa
Hornitos
Catheys Valley
Mormon Bar
Boot Jack
Lushmeadows
Wawona
Fish Camp
Ponderosa Basin
Yosemite Village
El Portal
Yosemite West
Tenaya Lake
Lake Don Pedro
Don Pedro Reservoir
Lake McClure
Lake McSwain
Burns Reservoir
Bear Reservoir
Owens Reservoir
Mariposa Reservoir
Yosemite Lake
H. V. Eastman Lake
Stanislaus National Forest
Sierra National Forest
Yosemite National Park
Tuolumne River
Middle Tuolumne River
South Fork Tuolumne River
Clavey River
North Fork Merced River
Merced River
South Fork Merced River
Burns Creek
Bear Creek
Owens Creek
Mariposa Creek
Middle Fork Chowchilla River
East Fork Chowchilla River
Chowchilla River
Fresno River
120
59
132
49
140
41
Elevation (ft)
< 0
0 - 1,000
1,000 - 2,000
2,000 - 3,000
3,000 - 4,000
4,000 - 5,000
5,000 - 6,000
6,000 - 7,000
7,000 - 8,000
8,000 - 9,000
> 9,000
Legend
Y-M IRWM Boundary
California Counties
National Park/Forest Areas
Communities
Community Areas
N
0
30,000
Scale: Feet
Kennedy/Jenks Consultants
Yosemite - Mariposa IRWM Plan
Region Boundary
July 2014
K/J 1388011*00
Figure 2-1
Path: Z:\Projects\Yose-Mari\RWM\Events\20130805_IRWMP_Report_Maps\Final Report - July 2014\F 2-1 Region Boundary.mxd
Source: Mariposa County



Path: Z:\Projects\Yose-Mari\RWM\Events\20130805_IRWMP_Report_Maps\Final Report - July 2014\F 2-2 Major Watersheds and Groundwater Basins.mxd

Source: Mariposa County and Department of Water Resources.

The Region includes portions of several watersheds including the Merced River, Lower Mariposa County Group of Streams, and the Chowchilla/Fresno (Department of Water Resources). The overall land area of each watershed is summarized in Table 2-1. Almost the entire upper Merced River watershed from high Sierra sources to dams at Lake McClure and McSwain lies within the Region with headwaters primarily on public lands: Yosemite National Park, Stanislaus National Forest, Sierra National Forest and BLM land (the headwaters of the Merced River is in Madera County). Downstream of Lake McClure and McSwain, the lower Merced River continues westerly to the west ending at the confluence with the San Joaquin River in Merced County. Similarly, upper tributaries of the Chowchilla and Fresno Rivers are in the Y-M Region but flow southerly to reservoirs in the adjacent Madera IRWM Region to the south. Other bordering regions include the Tuolumne-Stanislaus IRWM Region to the north, the Inyo-Mono IRWM Region to the east and the East Stanislaus IRWM Region to the northwest.

Table 2-1: Y-M Region Watershed Areas

Watershed	Acres within Region	Square Miles within Region	Percent of Total Region
Merced River Watershed	595,204	930	64
Lower Mariposa County Group of Streams Watershed	211,838	331	23
Chowchilla/Fresno River Watershed	128,186	200	13
Total Area within Region Boundary	935,228	1,461	100

Note: Total acreages of each watershed are only the portions of the watersheds located within the Y-M Region.

The Yosemite-Mariposa Region is sparsely populated, with approximately half the 18,000 residents living in small communities dotting the western portion of the Region. The remainder of the population resides in rural settings. There are no incorporated cities in Mariposa County. The larger communities include the Town of Mariposa with approximately 2,173 residents, Yosemite Village with approximately 1,035 residents, and Lake Don Pedro subdivision with a population of just fewer than 1,077. The majority of the land contained in the Region is unincorporated public lands managed by federal agencies including; the National Park Service (NPS), Bureau of Land Management (BLM), and the United States Forest Service (USFS).

The Region boundary is wholly included within the San Joaquin Funding Area as defined by the California Department of Water Resources (DWR) and was previously proposed to be included in a larger “Central California” IRWM Region. Under the direction of DWR to eliminate any areas of overlap, the “Central California” region was redefined and included formation of the Yosemite-Mariposa region. Ultimately three regions: Yosemite-Mariposa, Madera, and Merced were established in collaboration with DWR.

2.3 History of Water Development in the Region

The abundant water resources of the Yosemite-Mariposa Region have been developed for agricultural, municipal, and other uses in the Central Valley. West of the Y-M Region, the Merced River and Mariposa Creek eventually flow into the Lower San Joaquin River, a tributary to the Sacramento-San Joaquin Bay-Delta estuary. The Merced River begins high in the Sierra Nevada and provides a reliable, year round water source through rain, snow melt and melting glaciers. As a result, the upper watersheds of the Central Sierra have historically provided reliable water sources for the San Joaquin Valley; meeting needs of agricultural and municipal water users, and contributing to recharging groundwater basins. Within the Region, the water conveyed by the Merced River and other tributaries is a critical resource that supplies both Merced and Mariposa Counties with surface water and helps alleviate the draw on limited groundwater supplies. The Merced River and other tributary waterways provide invaluable ecosystem habitat, water supply, and sources of renewable hydroelectric power generation.

Lake McClure
Credit: Kristen Boysen, Sierra Foothill Conservancy

The following description of the historical human influences on water supply development and use in the Region provides essential context for understanding some of the complex relationships that surround water management, and the way these relationships have affected the water resources landscape over time. Historical understanding also provides a common foundation for addressing the Region's challenges and opportunities in the IRWM Plan.

2.3.1.1 Early History

The earliest known indigenous people of the Y-M Region are the Southern Sierra Miwok Nation, who have occupied their traditional territory for approximately 10,000 years. The indigenous people served as the first stewards of the water and other natural resources (Mariposa County 2006). Ethnohistoric information suggests that the inhabited range of the Southern Sierra Miwok extended approximately from the watershed division between the Tuolumne River and the Merced River on the north, the Sierra crest on the east, the Fresno River on the south, and to a line along the base of the Sierra foothills on the west. The Miwok occupied the lower western foothills of the Sierra and entered from the west, but actively travelled across the Sierra crest for trade and resource procurement. Representatives of the Miwok Tribe are still present in the Region today. (InteResources Planning, Inc., 2013)

2.3.1.2 19th Century

Before the discovery of gold, few westerners settled within the Region. Near the mid-1800s development was spurred by the gold rush that resulted in many settlements developed to support the mining activity including: Bagby, Coulterville, Mormon Bar, Haydensville (renamed Bear Valley), Hornitos, Greeley Hill, Mt. Bullion, Catheys Valley, and Wawona (County of Mariposa, 2006). Miners settled along waterways where they could placer mine. As mining developed, streams were engineered to support more efficient surface mining techniques and waterways were modified. Beginning in 1849, with the opening of the Mariposa Mine, the first stamp mill in the county, commercial mining began to transition to hard rock mining. In addition to hard rock mining, some areas were drag-line dredged in the early 1900s such as Mormon Bar, located in south-central Mariposa County (County of Mariposa, 2006).

As the 1850s came to a close, people were coming to the foothills more for its grazing and farming land than the gold in the mines (VM, 1998). Employment was offered on a seasonal basis by ranchers and some held mining claims on major streams which were to be worked sporadically. Many of the pioneer families who still live in Mariposa County were established. In 1864, Congress passed the Yosemite Grant Act giving guardianship of the Yosemite Valley and the Mariposa Grove to the State of California "upon the express conditions that the premises shall be held for public use, resort, and recreation," thereby helping protect the park from excessive development (Sierra Club, 2013). This act alone saved these mountain features for future generations. By 1913, all the properties were in the hands of the federal government and became the complete Yosemite National Park.

2.3.1.3 Development of Natural Water Systems and Water Supply Infrastructure

The rise of agriculture in the San Joaquin Valley during the early 1900s led water purveyors outside of the Region to build water infrastructure, including the creation of Exchequer Dam initially in 1926 and replaced in 1967 and McSwain dam just downstream near the Mariposa County line creating Lakes McClure and McSwain respectively in order to provide storage for hydroelectric power generation, and secure water supplies for agricultural and municipal water users in Merced County. Other small dams and impoundments were also constructed on some of the smaller watersheds in the Y-M Region. These facilities helped to regulate and control natural waterways to provide a seasonal water source for much of the year for both local and distant users. Limited water supply infrastructure was developed as the larger communities were formed. Residents outside these communities without access to community based water distribution systems relied and commonly still rely on individual domestic wells, stock ponds, rain water cisterns, and seasonal creeks for water supplies.

2.4 Population and Economic Conditions

The Y-M Region is characterized by an aging and slow growing residential population, with 38% of the population at 55 years or older and a projected population growth of only 12% by 2020. The Region provides a world-renowned travel destination and experiences an annual influx of over 3.8 million visitors that visit Yosemite National Park and other areas of interest such as the Stanislaus Forest, Sierra National Forest and BLM land. This influx occurs primarily in a 5-6 month period during the warmer months of the year. As a result, hotels and restaurants make up the Region's cornerstone industries, in addition to livestock production and government agencies. The Region has a strong middle class and a stable, educated workforce, however, despite generally low population growth rates; job growth has been unable to keep pace with employment needs. As a result, a large portion of the Region's workforce commutes to jobs in neighboring counties where employment opportunities are more available.

Downtown Coulterville
Credit: Pat Garcia

2.4.1 Population

The current population estimate for the Region is 18,251 according to the 2010 US Census. This makes the Y-M Region a very low population density consistent with a rural makeup, averaging 13 persons per square mile compared with a 240 persons per square mile statewide average. Historically, the Region has experienced sporadic population growth and declines, with overall slow growth. Between 1930 and 1970, the population grew by less than 3,000 to a population of barely over 6,000. After significant positive growth between 1930 and 1940, the population again declined until 1960. The most significant growth in the Region since 1930, was then seen between 1970 to 1980 when the population grew by 86 percent. The population in the Region continued its rapid growth in the 1990s, approximately 20% over the decade, and leveled off from 2000 to 2008 with a total population growth of less than four percent through the 8-year period, as shown on Figure 2-3. Population growth has been highest in the Coulterville Area, including Lake Don Pedro Community, and lowest in Catheys Valley (Sierra Institute, 2010).

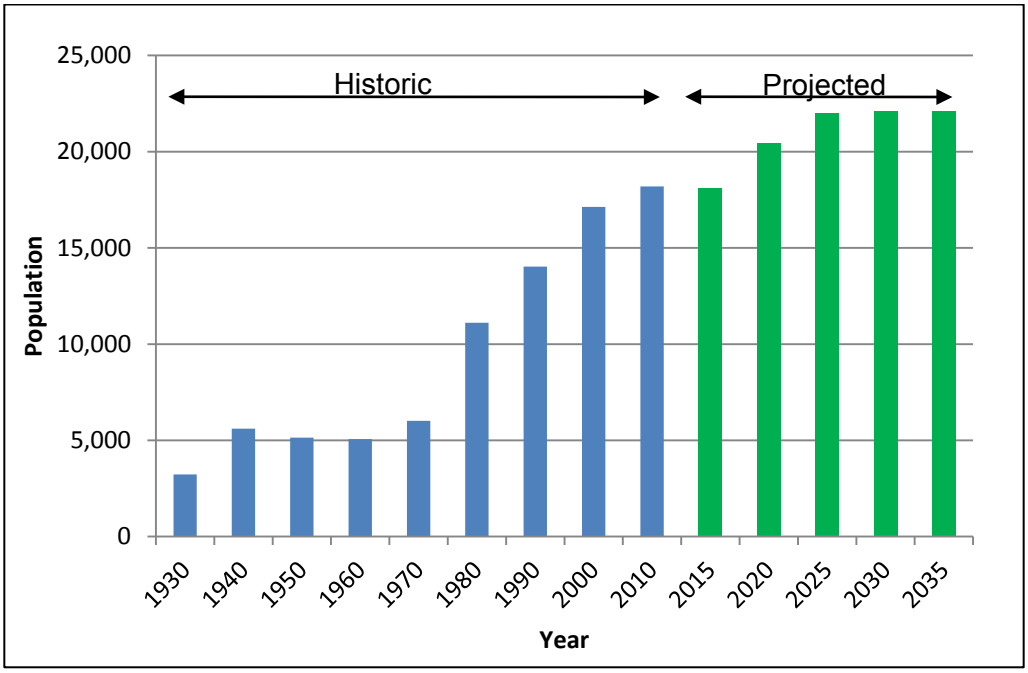


Figure 2-3: Historic and Projected Yosemite-Mariposa Region Population

The 2008 Mariposa County General Plan estimates a buildout population of 28,000 people. Using the California Department of Finance 2013 projections, Table 2-2 that follows provides an estimate of population growth from 2010 through the 2035 planning horizon. The population is projected to increase by approximately 23% by 2035; less than 1% annually.

Table 2-2: Mariposa County Population Projections

Year	Estimated Population
2010	18,193
2015	18,115
2020	20,463
2025	22,008
2030	22,186
2035	22,459

Source: California Department of Finance, 2013

2.4.2 Demographics

There are 18,251 people in Mariposa County that live in 2,430 single family owner occupied homes. Of these 18,251 people, 2,940 are over 65; 3,516 have a disability, and 9,150 people are in the workforce. Much of this work is seasonal employment centered on the service and hospitality based tourism industry (County of Mariposa, 2010). Specifically for the Mariposa community, limitations in infrastructure provided by MPUD have had a controlling effect on the area's ability to support sustained growth. The seasonal population in the Y-M Region can be attributed to the Yosemite National Park visitors, numbering up to four million per year. While some of the park is located outside the Region's boundary in Tuolumne and Madera Counties, Yosemite Valley is in the Region and serves as the main tourist destination.

The Region has historically been characterized by an older population with more than half of residents over the age of 45, and this proportion is steadily growing. Since the early 1980s and more significantly starting in 2000, the population has seen a declining trend in persons under 45, most significantly in the group of 35-44. Main factors in this trend include the attractiveness of the Region as a retirement location and a shortage of job opportunities for young adults. Age distributions and other metrics based on the American Community Survey are presented in Table 2-3.

Ethnic diversity is not significant in the Y-M Region and there is generally no particular sub-area with minority concentrations within the Region. The population is predominantly (80%) Caucasian. There is a relatively small Latino population of approximately 9 percent as of 2010 (U.S. Census, 2010). American Indians make up approximately 3 percent of the population, African Americans, Asian/Pacific Islanders, and multiracial individuals make up the remaining small proportion of the population.

Table 2-3: Demographic Data

	Mariposa County	Mariposa % of Total Population	California % of Total Population
Age			
Under 5 years	775	4.25%	6.79%
5 to 9 years	821	4.50%	6.73%
10 to 14 years	987	5.41%	6.95%
15 to 19 years	1,026	5.62%	7.58%
20 to 24 years	827	4.53%	7.42%
25 to 34 years	1,651	9.05%	14.27%
35 to 44 years	1,828	10.02%	13.91%
45 to 54 years	3,232	17.71%	14.10%
55 to 64 years	3,283	17.99%	10.84%
65 to 74 years	2,253	12.34%	6.11%
75 to 84 years	1,186	6.50%	3.68%
85 years and over	382	2.09%	1.61%
Gender			
Male		50.79%	49.71%
Female		49.21%	50.29%
Household Income Distribution			
Less than $10,000		7.39%	5.31%
$10,000 to $20,000		15.55%	9.76%
$20,000 to $30,000		8.51%	9.36%
$30,000 to $40,000		8.6%	8.9%
$40,000 to $50,000		11.15%	8.34%
$50,000 to $75,000		17.34%	17.62%
$75,000 to $100,000		13.27%	12.8%
$100,000 to $150,000		12.87%	15.02%
$150,000 to $200,000		2.99%	6.38%
$200,000 or more		2.34%	6.5%
Median household income (dollars)	$49,098		

Source: 2006-2010 American Community Survey

2.5 Economic Conditions and Trends

2.5.1 Socioeconomic Conditions

The socioeconomic conditions have changed significantly since the gold rush in the 1850s. The present day economy still includes some mining, but is primarily focused on tourism and secondarily on agriculture. Tourism, including the hospitality and leisure sectors, provides the most jobs in the area and the resulting transient occupancy taxes account for close to half of the County's discretionary budget. The travel and tourism industry generates approximately 4,000 full and part-time jobs in Mariposa County, or approximately 40% to 50% of the total employment in the County. A challenge for the County is that the sparse population does not generate a significant revenue stream. Agriculture is a focus due to the Region's rich rural history and suitability of the lower elevation foothill areas for grazing lands.

Median household income varies significantly across Mariposa County. In 2000, the Yosemite/El Portal/Wawona area had the highest median income in the Region, exceeding incomes in the rest of the Region by 25%. This is most likely due to the close proximity of Yosemite National Park, which provides steady but limited employment. Within this part of the Region, income and impoverishment are apparently quite diverse, as well: the Yosemite/El Portal/Wawona area had the highest median income but also the highest unemployment rate and highest percent of households below poverty level in 2000 (Sierra Institute, 2010). Income distribution based on the 2010 American Community Survey is provided

in Table 2-3. It should be noted that only a portion of Yosemite National Park is within the Region.

2.5.2 Disadvantaged Communities

Disadvantaged Communities (DACs), as defined by both Propositions 50 and 84, are communities whose average Median Household Income (MHI) is less than 80 percent of the statewide annual MHI. Severely disadvantaged communities are defined as communities with an average MHI less than 60 percent of the statewide annual MHI. In 2010, 80 percent of the state of California's MHI was $48,706, with a statewide MHI of $60,883. A number of communities within the Y-M Region have been identified as DACs. Figure 2-4 shows a graphical representation of the distribution of DACs within the census designated places, census tracts, and census block groups within Mariposa County.

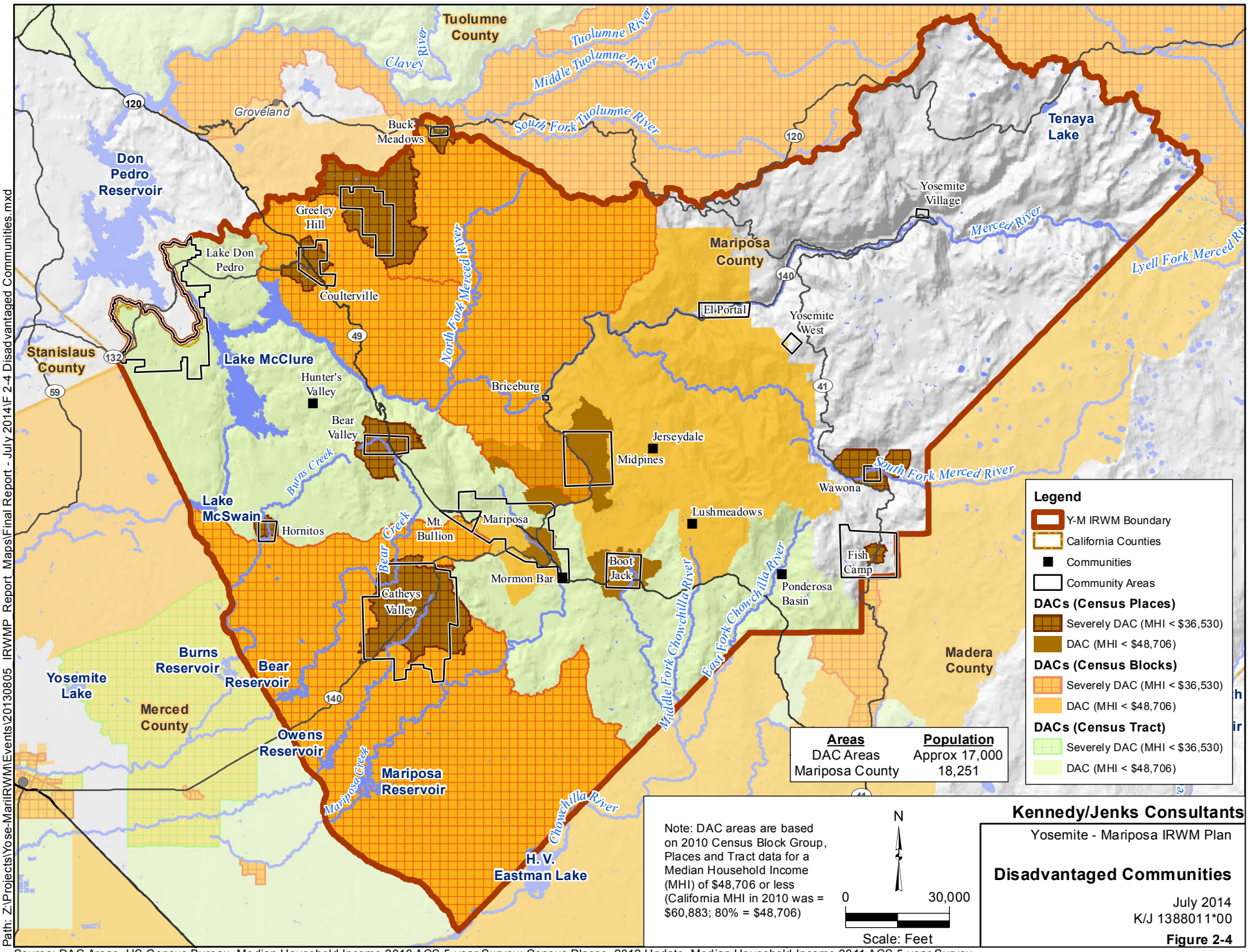
Gold Panning
Credit: Lauren Hubert

In the Region, unemployment and free and reduced school lunch enrollment trends suggest a significant increase in impoverishment over the past several years as related to the economic downturn. According to State data, unemployment increased from below 6% in 2006 to over 10% in 2009, and student enrollment in the free and reduced school program increased by 35% from 2006-2007 to the 2008-2009 school year. One of the focuses of this planning effort is to better understand and address the water related needs of DAC and SDAC throughout the Region, and provide multiple avenues for these communities to have a voice in the IRWM Planning process.

2.5.3 Recreation

Recreation is the foundation of most of the economic output in the Region, and much of the recreation and tourism industry is linked to water, either directly or indirectly. There are several sources of water-dependent recreation in the Region. The Merced River, Lake McClure, and Lake McSwain provide ample opportunity for fishing, boating, rafting, kayaking, and house boating. Whitewater rafting is permitted throughout Merced River Canyon from the downstream half of Yosemite Valley to the entrance of Lake McClure. The streams and creeks are also a fishing source when in season.

The Yosemite National Park is home to many waterfalls and meadows that attract a number of visitors each year. These falls range from a couple hundred feet to over two-thousand feet. Additional water features include frazil ice and horsetail falls that can appear to glow at sunset. Other activities at Yosemite including; photography, auto touring, backpacking, biking, bird watching, camping, fishing, hiking, horseback riding are centered around the park's water features (NPS, 1).



Source: DAC Areas, US Census Bureau, Median Household Income 2010 ACS 5-year Survey; Census Places, 2012 Update, Median Household Income 2011 ACS 5-year Survey.

A large portion of the Region is dominated by national forest lands, which also provide significant recreational opportunities to visitors of the Y-M Region. The Sierra and Stanislaus National Forests, that comprise approximately 19% of the Region's land area, are valuable and accessible overnight destinations that offer a full range of year-round recreational activities similar to those in Yosemite, including camping, hiking, hunting, biking, and horseback riding.

An additional source of recreation is the portion of the Merced River designated as Wild and Scenic. This designation requires that the National Park Service prepare a comprehensive management plan for the 81-mile river corridor that runs through Yosemite National Park. The Merced River Plan was released in final form in February 2014 after several attempts had been made to finalize the plan since a disastrous flood in 1997 hit the Yosemite Valley. The Plan would call for the restoration of 203 acres of meadow and riparian habitat in Yosemite Valley, as well as the addition of 174 campsites, and puts limits on daily peak visitors, in an effort to balance the preservation of this natural resource and its public use (Sacramento Bee, 2013).

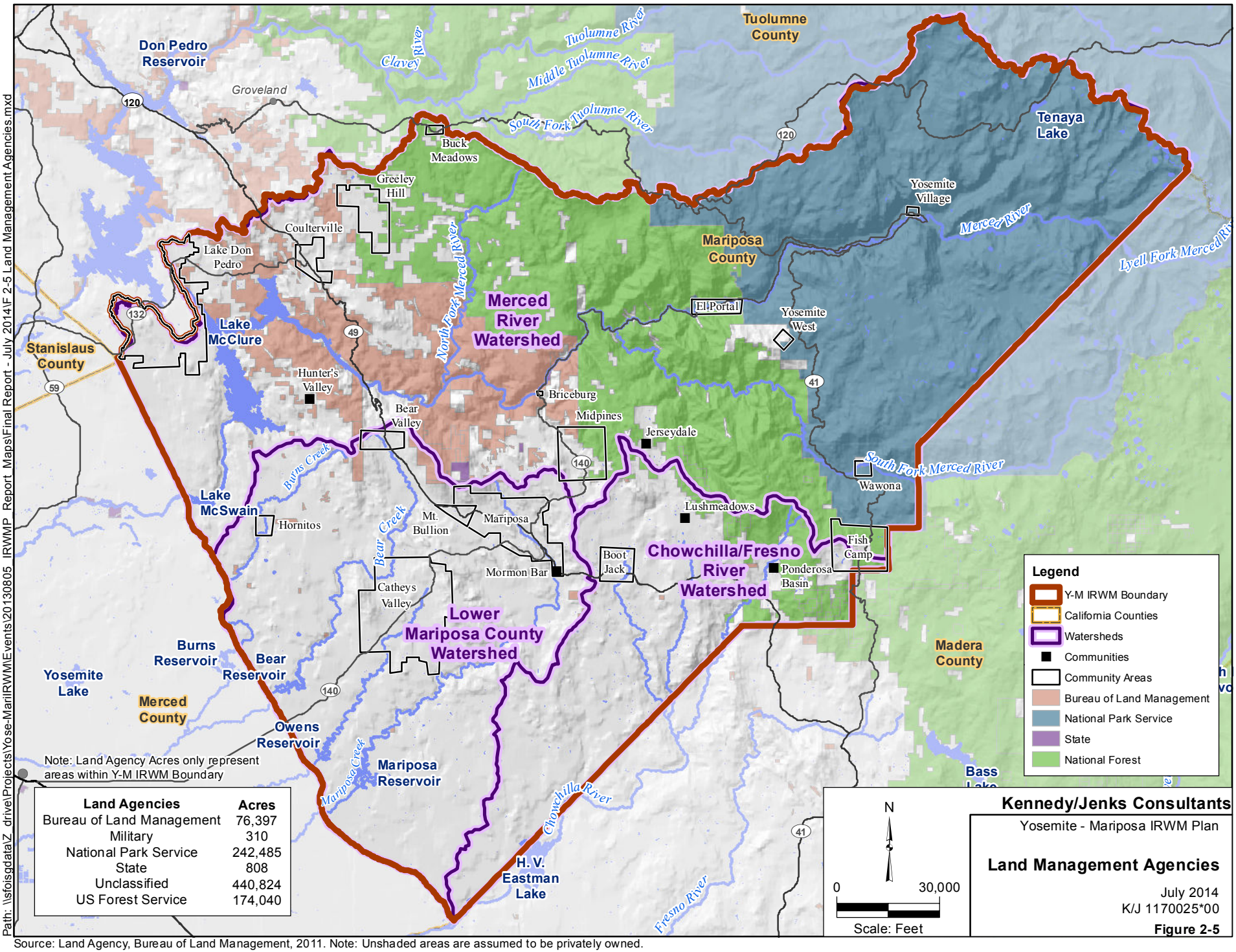
2.6 Land Use and Management

The Y-M Region contains approximately 1,461 square miles of land with approximately 53% being classified as federal lands managed by various agencies as shown on Figure 2-5. More specifically, the Sierra and Stanislaus National Forests comprise approximately 19% of the Region, the Yosemite National Park comprises approximately 26%, and the Bureau of Land Management controls approximately 8% of the land. These lands do not directly generate any tax revenue for the County and are managed for multiple and varied uses by their regulating agencies. The remainder of the land is privately owned and governed by Mariposa County. This area is rich in archeological and historic resources with many historic sites recognized nationally. Section 4 provides a description of the interrelationships between land management and planning efforts and water planning.

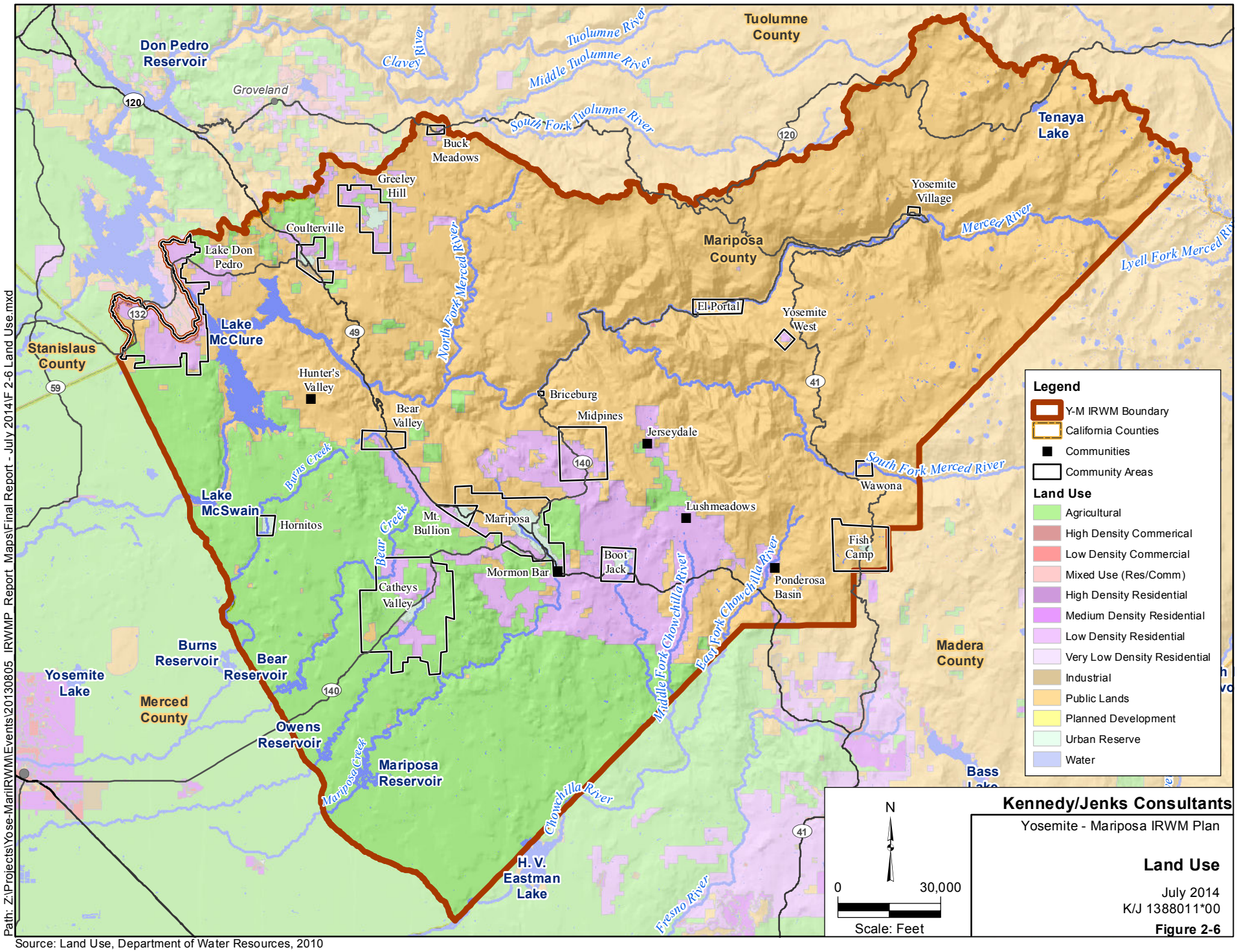
Current land ownership and land management constraints in the Region help maintain large areas of agricultural land and open space. Nearly 80% of the land is protected from significant development because it is publicly owned, enrolled in State Land Conservation Act of 1965 (better known as the Williamson Act) or Timberland Production Zone, or covered by a privately held conservation easement. Under County zoning, less than 14% of all land in the County is zoned to allow lot sizes below 160 acres. However, State or County policy changes or private landowner non-renewal in the Williamson Act or Timber Production Zone programs could increase the number of acres available for development along with the continued use of historic parcels to establish subdivisions and circumvent current County zoning (Sierra Institute, 2010). Table 2-4 that follows summarizes the land uses and acreages by land management agencies while Figure 2-6 shows the land uses as identified by Department of Water Resources.

Table 2-4: Governmental and Land Management Agencies

Agency	Agricultural (acres)	Industrial (acres)	Commercial (acres)	Residential (acres)	Mixed Use (acres)	Open Space (acres)	Urban (acres)	Total (acres)	Portion of Region
Army Corps of Engineers	310	0	0	0	0	0	0	310	0.03%
Sierra National Forest	5	0	0	184	0	2,236	0	2,425	0.26%
Stanislaus National Forest	113	23	35	751	0	170,654	40	171,615	18.4%
State Land	0	0	0	80	0	728	0	808	0.09%
Bureau of Land Management	3,048	88	0	775	0	72,465	21	76,397	8.2%
Yosemite National Park	0	0	0	0	0	242,456	29	242,485	25.9%
Other Non-Federal lands	265,681	530	72	80,958	0	88,132	5,451	440,824	47.2%
Total:	269,157	641	107	82,748	0	576,671	5,540	934,864	



Source: Land Agency, Bureau of Land Management, 2011. Note: Unshaded areas are assumed to be privately owned.



Source: Land Use, Department of Water Resources, 2010

2.6.1 Communities

There are no incorporated cities within the Y-M Region, instead population clusters are concentrated around numerous communities with varying planning policy approaches. These communities are briefly summarized below and shown on Figure 2-1.

Table 2-5: Communities of the Y-M Region

Community	Summary
Bear Valley	Bear Valley is a Planning Area of approximately 125 persons (County of Mariposa, 2010), located about 11 miles northwest of Mariposa. It was designated a California Historical Landmark as a result of its historical gold mining significance within the Mother Lode gold belt. It is a Planning area with a Community Plan.(http://en.wikipedia.org/wiki/Bear_Valley,_Mariposa_County,_California)
Bootjack	Bootjack is a Planning Area located just southeast of Mariposa with a total population of 960. (http://en.wikipedia.org/wiki/Bootjack; Mariposa County, 2010)
Catheys Valley	Catheys Valley is a rural community located in western Mariposa County. It is the fifth largest community in the Region with a population of approximately 825 (County of Mariposa, 2010). Few dwellings within this Community Planning Area are for occasional or seasonal use. The majority of the single-family dwelling units are owner occupied. A Community Plan has been adopted.(County of Mariposa, 2012a)
Coulterville	Coulterville is a Planning Area of approximately 194 acres located in the foothills of the Sierra Nevada with an adopted Community Specific Plan. Over 50 percent of the area population are permanent residents, with a predominately retired community make-up.
El Portal	El Portal is a Planning Area located along the western boundary of Yosemite National Park with a population of 474 (County of Mariposa, 2010). This community is partly under the administrative jurisdiction of Yosemite National Park. (http://en.wikipedia.org/wiki/El_Portal,_California)
Fish Camp	The Fish Camp Town Planning Area comprises approximately 280 acres in the Central Sierra Nevada. The majority of the community residences are utilized as second or vacation homes, occupied infrequently or on a seasonal basis. The total permanent resident population is estimated at approximately 59 (County of Mariposa, 2010). This Planning Area has an adopted Specific Plan. (Fish Camp Specific Plan)
Greeley Hill	The Greeley Hill Community is a large community located in the western portion of the Region with a population of approximately 915. (http://en.wikipedia.org/wiki/Greeley_hill; Mariposa County, 2010)
Hornitos	The Community of Hornitos is a very small community south of Coulterville with a population of just 75. (http://en.wikipedia.org/wiki/Hornitos,_California)
Lake Don Pedro	The Community of Lake Don Pedro is located partly in Tuolumne and Mariposa Counties and is situated between Lake Don Pedro and Lake McClure among the larger communities in the Region with a population of 1,077. (http://en.wikipedia.org/wiki/Lake_Don_Pedro,_California; Mariposa County, 2010)
Mariposa	The Mariposa Town Planning Area encompasses the historic community of Mariposa, extending over an area of approximately 1900 acres, within the western foothills. The town lies at the southern terminus of the Mother Lode. The population is approximately 2,173 (County of Mariposa, 2010), with a growing residential population. (Mariposa Specific Plan)
Midpines	The Community of Midpines is located north of Mariposa, among the Sierra Nevada foothills. It currently has a population of 1,204. (http://en.wikipedia.org/wiki/Midpines, Mariposa County, 2010)
Wawona	Wawona is a historic residential and resort community located within the boundary of Yosemite National Park. Approximately 169 people reside in the community County of Mariposa, 2010), the majority of which are employed by either the National Park Service or the Yosemite Concessionaire. (County of Mariposa, 2012c)
Yosemite Village	The Community of Yosemite Village is located within Yosemite National Park and is the primary developed place in the Yosemite Valley. The majority of the permanent population includes National Park Service staff and concession workers. (http://en.wikipedia.org/wiki/Yosemite_Village)
Yosemite West	Yosemite West is a private community of resort homes located just outside of Yosemite National Park, along the southern boundary. Homes in the area consist of permanent residences as well as vacation rentals. (http://en.wikipedia.org/wiki/Yosemite_West)

2.6.2 Native American Tribes

As noted earlier, during late pre-contact and early contact times the Southern Sierra Miwok inhabited the lower banks of the Merced River and the Chowchilla River, as well as Mariposa Creek with an inhabited range from the Sierra Crest, the divide between the Tuolumne and Merced Rivers, the Fresno River and along the base of the Sierra foothills. They also actively travelled across the Sierra crest.

Woman with Gathering Basket
Credit: Sierra National Forest Historical Photo Database 2011

The area, along with the upper elevations of the Sierra were also traversed and utilized by other groups including the Central Sierra Miwok and Northern Paiute. The Mono people (considered Northern Paiute) occupied the higher eastern Sierra and the Mono Lake Basin, and entered Yosemite from the east.

After Euro-Americans entered Yosemite and established Yosemite National Park, the residents were of both Paiute and Miwok origin: they had either fought to a stalemate or agreed to peaceful coexistence, and had intermixed to a limited extent. Today, several groups of Native Americans from both the west and east sides of the Sierra in the Yosemite region have active interest and ongoing activities within the Y-M IRWM Region. Such activities include: sacred practices, resource procurement/hunting and gathering, and residency. There is a wide array of Native American interest in water issues within the project area (InteResources Planning, Inc., 2013).

2.7 Climate

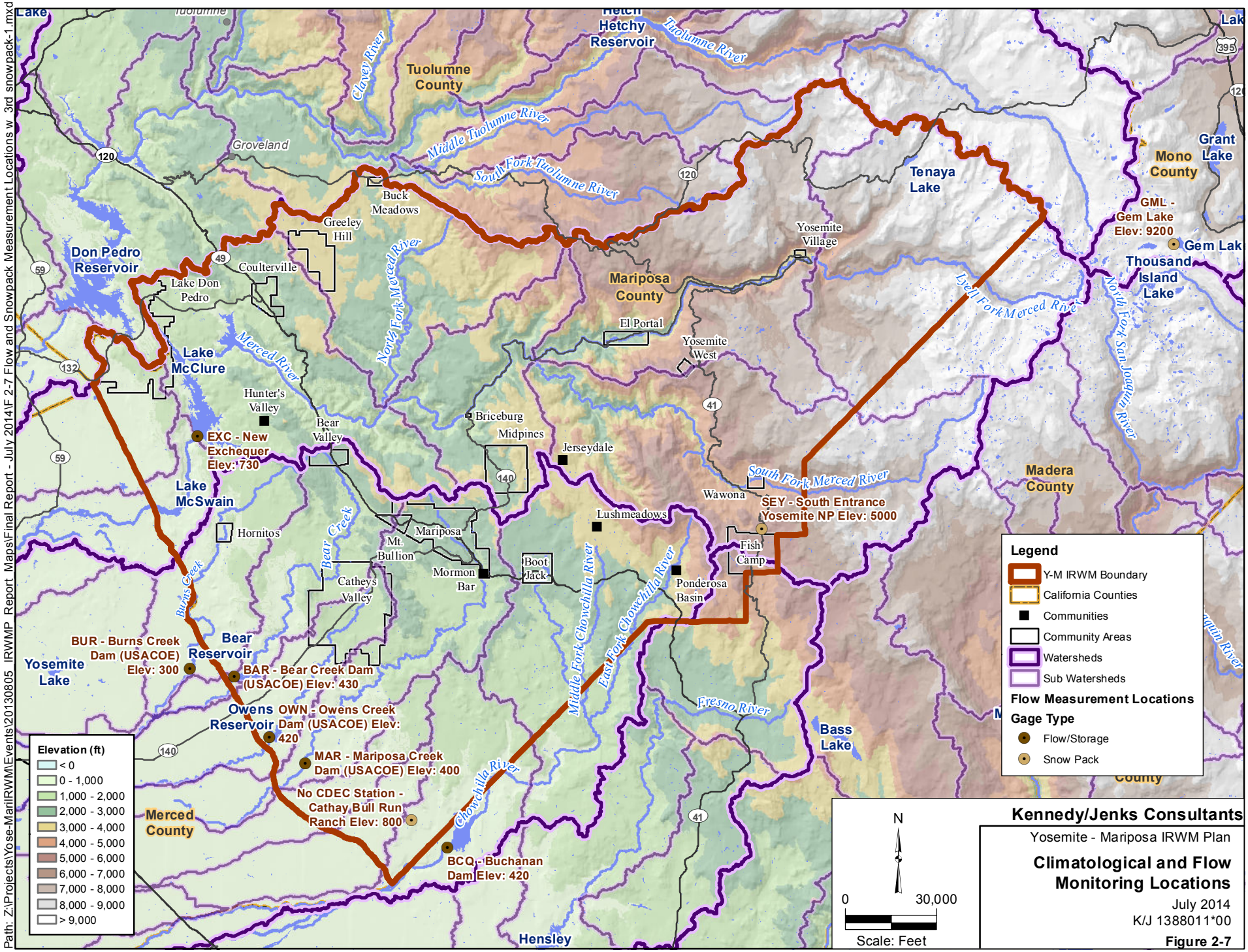
The Y-M Region has a varied terrain with the Sierra Nevada in the eastern portion of the region sloping down to the lower foothills near the Mariposa/Merced County line. The lower elevation foothill areas experience hot, dry summers with little to no precipitation and mild, wet winters with moderate to heavy precipitation. The higher elevations, generally above 5,000 feet, typically experience more severe winters, accompanied by heavy snowfall. The upper foothills experience moderate snowfall with the lower foothills receiving predominantly rainfall. The annual average rainfall ranges from 20 – 43 inches depending on the elevation.

Ice along Waterway
Credit: Pat Garcia

2.7.1 Precipitation and Snow Pack

The higher elevation, mountainous terrain of the Sierras, as shown on Figure 2-1, typically receives large amounts of snow fall each year, which during periods of snowmelt provides significant seasonal runoff, supplying the streams and rivers of the watersheds throughout the spring and early summer. Much of this snow pack, located in Yosemite National Park in the eastern side of the Region, provides a significant portion of water supply for use in the Central Valley, particularly Merced County and a small portion of the water supply used in the Y-M Region.

Snow depths throughout the Region vary widely due to terrain composition, vegetation, and significant elevation changes from approximately 300 ft. in the lower foothills to nearly 11,000 feet at the crest of the Sierra Nevada Mountains. There are several snow depth and precipitation monitoring locations shown on Figure 2-7. Most stations are monitored by the Department of Water Resources,


Path: Z:\Projects\Yose-Mari\RWM\Events\20130805_IRWMP_Report_Maps\Final Report - July 2014\F 2-7 Flow and Snowpack Measurement Locations w_ 3rd snowpack-1.mxd
Lake
Tuolumne
Hetch Hetchy Reservoir
Tuolumne River
Clavey River
Tuolumne County
Middle Tuolumne River
South Fork Tuolumne River
Groveland
Buck Meadows
Greeley Hill
Don Pedro Reservoir
Coulterville
Lake Don Pedro
North Fork Merced River
Merced River
Lake McClure
Hunter's Valley
Bear Valley
EXC - New Exchequer Elev: 730
Lake McSwain
Hornitos
Bear Creek
Burns Creek
BUR - Burns Creek Dam (USACOE) Elev: 300
Bear Reservoir
Yosemite Lake
BAR - Bear Creek Dam (USACOE) Elev: 430
Owens Reservoir
OWN - Owens Creek Dam (USACOE) Elev: 420
MAR - Mariposa Creek Dam (USACOE) Elev: 400
No CDEC Station - Cathay Bull Run Ranch Elev: 800
Merced County
Chowchilla River
BCQ - Buchanan Dam Elev: 420
Hensley
Briceburg
Midpines
Jerseydale
Mariposa
Mt. Bullion
Mormon Bar
Boot Jack
Catheys Valley
Lushmeadows
Wawona
Mariposa County
El Portal
Yosemite West
Yosemite Village
Tenaya Lake
Lyell Fork Merced River
South Fork Merced River
SEY - South Entrance Yosemite NP Elev: 5000
Fish Camp
Ponderosa Basin
Middle Fork Chowchilla River
East Fork Chowchilla River
Fresno River
Bass Lake
Madera County
North Fork San Joaquin River
GML - Gem Lake Elev: 9200
Gem Lake
Thousand Island Lake
Grant Lake
Mono County
Elevation (ft)
< 0
0 - 1,000
1,000 - 2,000
2,000 - 3,000
3,000 - 4,000
4,000 - 5,000
5,000 - 6,000
6,000 - 7,000
7,000 - 8,000
8,000 - 9,000
> 9,000
Legend
Y-M IRWM Boundary
California Counties
Communities
Community Areas
Watersheds
Sub Watersheds
Flow Measurement Locations
Gage Type
Flow/Storage
Snow Pack
N
0
30,000
Scale: Feet
Kennedy/Jenks Consultants
Yosemite - Mariposa IRWM Plan
Climatological and Flow Monitoring Locations
July 2014
K/J 1388011*00
Figure 2-7

or the Western Regional Climate Center. Tables 2-6 through 2-8 show temperature, precipitation, average monthly snow depth variation and other climate information within the Y-M Region at three elevation zones. The tables are intended to provide an example of typical seasonal precipitation and climate data, but each year can vary considerably.

Table 2-6: Typical Lower Foothills Climate Data (Elev. 1,430 ft.)

	Average Total Precipitation (in.)	Average Total Snowfall (in.)	Average Snow Depth (in.)	Average Max Temperature (°F)	Average Min. Temperature (°F)
January	3.39	0	0	53.9	33.5
February	3.2	0	0	58.6	37.1
March	2.79	0	0	61.9	38.3
April	2.19	0	0	68	40.6
May	0.68	0	0	77.7	47
June	0.13	0	0	88	54.5
July	0.04	0	0	95.5	60.7
August	0.07	0	0	94.3	59.6
September	0.31	0	0	88.7	55
October	1.02	0	0	77.4	47
November	2.91	0	0	63.6	38.9
December	3.56	0	0	55	33.7
Total	20.29	0.00	Not applicable	Not applicable	Not applicable

Climate Data based on Station number 041588 (Cathay Bull Run Ranch), period of record 7/1/1948-5/31/1977. www.wrcc.dri.edu.

Table 2-7: Typical Lower Sierras Climate Data (Elev. 5,120 ft.)

	Average Total Precipitation (in.)	Average Total Snowfall (in.)	Average Snow Depth (in.)	Average Max Temperature (°F)	Average Min. Temperature (°F)
January	8.5	20.7	8	46.4	25.7
February	7.12	20.3	9	47.8	26.4
March	6.56	23.5	7	50.3	27.8
April	3.7	11.1	2	56.2	31.1
May	1.72	1.2	0	65	37.2
June	0.58	0.1	0	73.9	43.7
July	0.12	0	0	82	49.4
August	0.1	0	0	81.3	48.6
September	0.64	0	0	76	44.5
October	2.32	0.4	0	65.8	37.3
November	5.08	6.5	1	54.4	30.3
December	6.93	16.7	4	47.9	26.4
Total	43.37	100.50	Not applicable	Not applicable	Not applicable

Climate Data based on Station number 048380 (South Entr Yosemite NP), period of record 7/1/1941-3/31/2013. www.wrcc.dri.edu. Note snowfall is included in the total precipitation

Table 2-8: Typical Sierra Nevada Climate Data (Elev. 8,970 ft.)

	Average Total Precipitation (in.)	Average Total Snowfall (in.)	Average Snow Depth (in.)	Average Max Temperature (°F)	Average Min. Temperature (°F)
January	3.63	33.2	36	37.1	14.8
February	3.66	40.6	60	38.5	14.7
March	2.92	26.3	57	44.4	18.3
April	1.62	15.7	51	50.2	24.3
May	0.86	4.3	25	57.6	31.9
June	0.49	1.1	6	64.8	39.6
July	0.55	0	0	73.2	47.7
August	0.59	0	0	71.3	47.2
September	0.7	1.1	0	64.5	40.3
October	1.14	6.9	1	54.9	32.9
November	2.11	16.8	6	45.8	25.1
December	3.18	34.1	18	38.4	19.1
Total	21.45	180.10	Not applicable	Not applicable	Not applicable

Climate Data based on Station number 043369 (Gem Lake), period of record 11/1/1924-9/30/2009. www.wrcc.dri.edu. Note snowfall is included in the total precipitation

The higher elevations around 9,000 feet and higher typically receive about 180 inches of snowfall in an average year, which is equivalent to about 21 inches of rainfall. At lower elevations (~1,400 feet) in the foothills, there is little snowfall but average annual precipitation of 20 inches is typical. At mid-level elevations (~5,000 feet), there is a combination of snow and rain resulting in a total precipitation of about 43 inches. The equivalent precipitation of snowfall can vary dependent on the consistency of the snowfall, but on average is a ratio of 10 inches of snowfall to 1 inch of precipitation (National Weather Service). As discussed throughout this IRWM Plan, some of the challenges for ensuring reliable water supplies for domestic, agricultural, recreational, and ecologically beneficial uses are linked to the variability in precipitation and snowfall each year. While average climatological conditions provide a long range indicator of water production in the watershed, the water supply each year can vary significantly due to the amount of precipitation that is received. For example, the 2013 and 2014 water years have been unseasonably dry, creating drought conditions in much of California, including Mariposa County. The sections throughout this Plan regarding Climate Change and water supply reliability factors cover these challenges in greater detail.

2.8 Hydrologic Systems

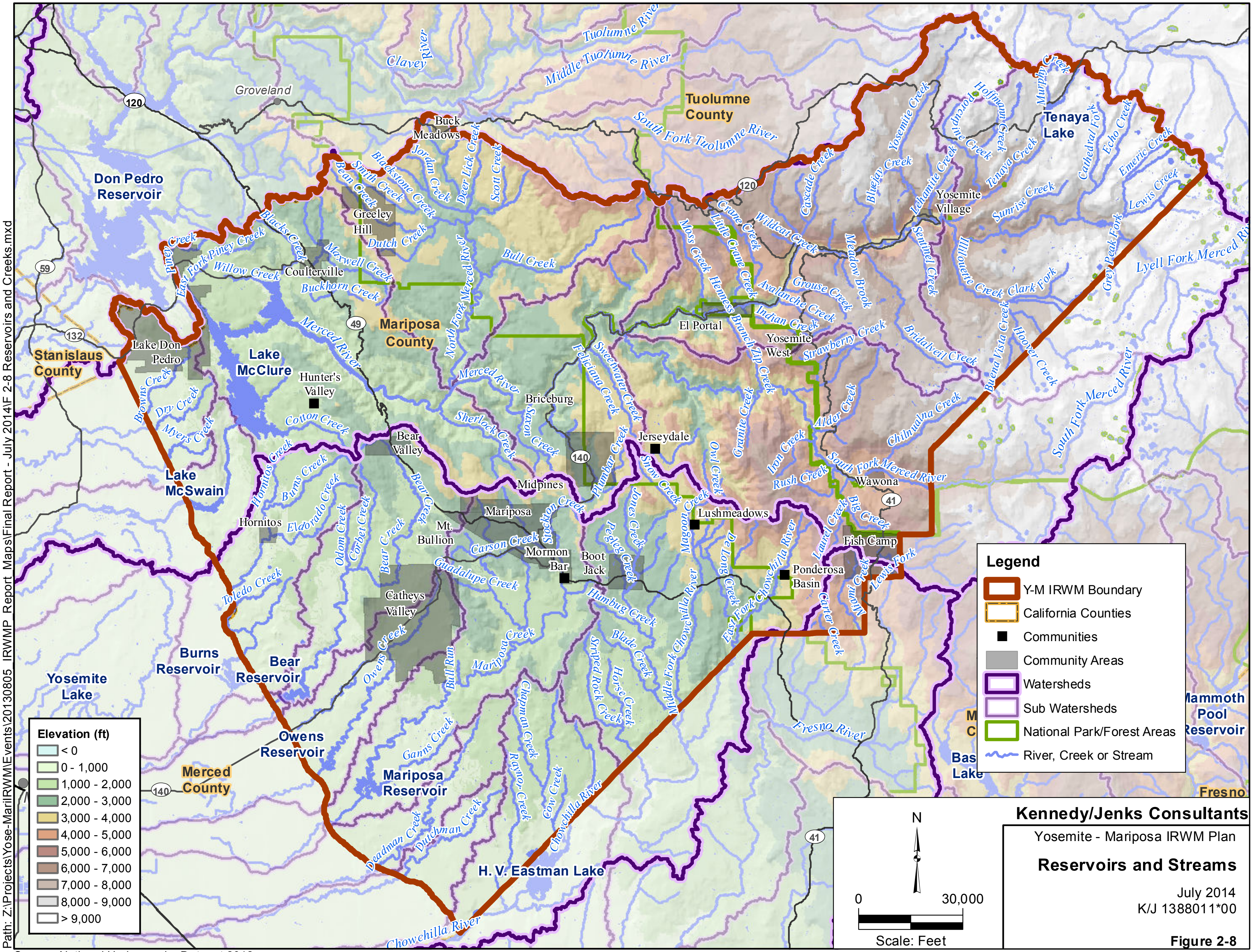
The three watersheds in the Y-M Region are the Upper Merced River Watershed, Chowchilla/Fresno River Watershed, and the Lower Mariposa Group of Streams each of which is described in greater detail below.

2.8.1 Surface Water

2.8.1.1 Upper Merced River Watershed

The Upper Merced River Watershed is the largest and most productive, comprising almost two-thirds of the entire Region area. The bulk of the Upper Merced watershed is located in the Yosemite National Park, surrounding National Forest and Bureau of Land Management lands. This affords protections by Federal agencies that are not typical of other western Sierra watersheds. Tributaries that feed the Upper Merced River include: Alder Creek, Bean Creek, Bear Creek, Big Creek, Bridalveil Creek, Cascade Creek, Chilnualna Creek, Devil Gulch, Echo Creek, Illinois Creek, Lewis Creek, Moss Creek, Tenaya Creek, and Yosemite Creek, as well as both the North and the South Forks of the Merced River as shown on Figure 2-8. At its source near Triple Divide, which is slightly south of the Region boundary, the watershed has been shaped by glaciation; jagged peaks, shallow lakes, and granite domes are characteristic of this zone. These features also characterize the upper reaches of the north fork of the upper Merced River as well.

The next zone is characterized by lodgepole pines and red firs in open meadows and canyons, interspersed among tumbled rock fields and granite slopes. The next zone of the watershed includes the broad U-shaped Yosemite Valley. The famous rock formations of Yosemite Valley – Half Dome, Cathedral Rocks, El Capitan – result from successive periods of glaciation. Glaciers left hanging valleys, from which descend the Valley's famous falls. Typical trees of this zone are ponderosa or yellow pine, incense cedar, and black oak. Stands of giant sequoias, the Tuolumne and Merced groves, are also found here. The next zone of the watershed is characterized by steep canyons that run in a generally southwest direction. The thin soils of the canyon walls support patches of grass, chaparral and oak woodland. The areas of lowest elevation in the watershed are the foothills which gradually descend toward the San Joaquin Valley floor. Characteristic vegetation for this zone includes gray pine, blue oak, and chaparral (CSWC, 2007).


Legend
Y-M IRWM Boundary
California Counties
Communities
Community Areas
Watersheds
Sub Watersheds
National Park/Forest Areas
River, Creek or Stream
Elevation (ft)
< 0
0 - 1,000
1,000 - 2,000
2,000 - 3,000
3,000 - 4,000
4,000 - 5,000
5,000 - 6,000
6,000 - 7,000
7,000 - 8,000
8,000 - 9,000
> 9,000
N
0
30,000
Scale: Feet
Don Pedro Reservoir
Lake McClure
Lake McSwain
Lake Don Pedro
Burns Reservoir
Bear Reservoir
Yosemite Lake
Owens Reservoir
Mariposa Reservoir
H. V. Eastman Lake
Tenaya Lake
Mammoth Pool Reservoir
Stanislaus County
Tuolumne County
Mariposa County
Merced County
Groveland
Buck Meadows
Greeley Hill
Coulterville
Hunter's Valley
Bear Valley
Briceburg
Midpines
Mariposa
Mt. Bullion
Mormon Bar
Boot Jack
Catheys Valley
Hornitos
Jerseydale
Lushmeadows
El Portal
Yosemite West
Yosemite Village
Wawona
Fish Camp
Ponderosa Basin
Tuolumne River
Middle Tuolumne River
South Fork Tuolumne River
Clavey River
Merced River
North Fork Merced River
South Fork Merced River
Chowchilla River
Middle Fork Chowchilla River
East Fork Chowchilla River
Fresno River
Lyell Fork Merced River
Cotton Creek
Bull Creek
Dutch Creek
Maxwell Creek
Buckhorn Creek
Willow Creek
East Fork Piney Creek
Blacks Creek
Bean Creek
Smith Creek
Blackstone Creek
Jordan Creek
Deer Lick Creek
Scott Creek
Sherlock Creek
Saxon Creek
Feliciana Creek
Sweetwater Creek
Plumbar Creek
Snow Creek
Owl Creek
Stockton Creek
Carson Creek
Guadalupe Creek
Humbug Creek
Blade Creek
Striped Rock Creek
Horse Creek
Jones Creek
Peggy Creek
Magoon Creek
Long Creek
Hornitos Creek
Burns Creek
Eldorado Creek
Odom Creek
Corbet Creek
Bear Creek
Toledo Creek
Owens Creek
Bull Run
Mariposa Creek
Ganns Creek
Chapman Creek
Raynor Creek
Cow Creek
Deadman Creek
Dutchman Creek
Browns Creek
Dry Creek
Myers Creek
Moss Creek
Little Crane Creek
Crane Creek
Wildcat Creek
Hennessy Branch
Zip Creek
Granite Creek
Avalanche Creek
Indian Creek
Grouse Creek
Strawberry Creek
Meadow Brook
Sentinel Creek
Illilouette Creek
Clark Fork
Bridalveil Creek
Buena Vista Creek
Hoover Creek
Chilnualna Creek
Alder Creek
Iron Creek
Rush Creek
Big Creek
Laurel Creek
Lewis Fork
Carter Creek
Cascade Creek
Bluejay Creek
Yosemite Creek
Lehamite Creek
Porcupine Creek
Hoffmann Creek
Tenaya Creek
Murphy Creek
Cathedral Fork
Echo Creek
Emeric Creek
Lewis Creek
Sunrise Creek
Grey Peak Fork
120
59
132
49
140
41
Fresno

Kennedy/Jenks Consultants

Yosemite - Mariposa IRWM Plan

Reservoirs and Streams

July 2014
K/J 1388011*00

Figure 2-8

Path: Z:\Projects\Yose-MariIRWM\Events\20130805_IRWMP_Report_Maps\Final Report - July 2014\F 2-8 Reservoirs and Creeks.mxd

Source: National Hydrography Dataset 2012.

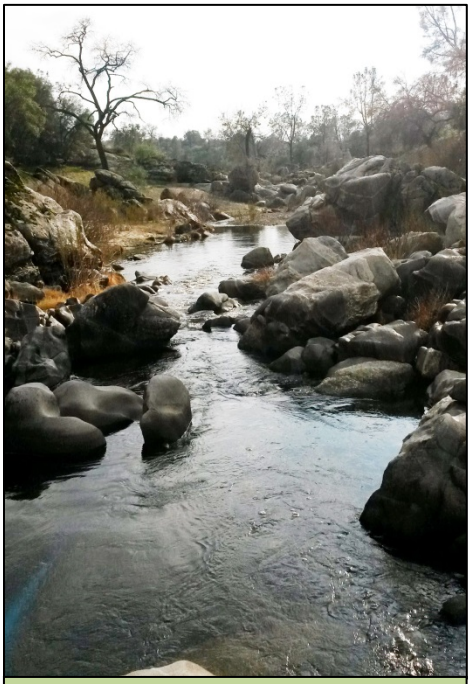
Bridalveil Fall
Credit: Daniel K. Horner

The Merced River flows west to Lake McClure, where it is impounded by the New Exchequer Dam owned and operated by the Merced Irrigation District (Merced ID). The tributary watershed area to Lake McClure is about 1,040 square miles. Merced ID diverts from the Merced River and delivers water to agricultural customers in Merced County. In 1987, the United States Congress designated portions of the Merced River as “Wild and Scenic” to protect its free-flowing condition and preserve its unique characteristics for the benefits and enjoyment of future generations. A comprehensive management plan known as the *Merced River Plan* has been formulated by the National Park Service and establishes a "River Protection Overlay" to ensure that the river channel and adjacent areas are protected. This overlay will provide a buffer area for natural flood-flows, channel formation, riparian vegetation, and wildlife habitat and will protect riverbanks from human caused impacts and associated erosion.

Yosemite National Park contains some of the dominant geographical features of Mariposa County; the three tallest waterfalls in North America are found in the County: Yosemite Falls at 2,425 feet, Sentinel Fall at 2,000 feet, and Ribbon Fall at 1,612 feet. In addition to the named waterfalls there are nine other waterfalls in the County area. The park is also the headwaters for the Merced River, located outside the Region, which is the principal watershed.

2.8.1.2 Chowchilla/Fresno River Watershed

The portion of the Chowchilla/Fresno River watershed in the Region includes the East, Middle, and West forks of the Chowchilla River. The East, Middle, and West Forks of the river merge and flow into Eastman Lake located in neighboring Madera County. The Bootjack, Chowchilla, and Ponderosa Basin areas are drained to the south by creeks that are tributaries of the Chowchilla River. Only the upper portion of the watershed is located in the Region with more than half located in the Madera IRWM Region. The following beneficial uses have been designated for the Upper Chowchilla River, source to Buchanan Reservoir: flood control, irrigation, water contact and non-contact recreation, warm water habitat, cold water habitat, and wildlife habitat (County of Mariposa, 2006).



Chowchilla River
Credit: Kristen Boysen, Sierra Foothill Conservancy

The Upper Chowchilla drainage area above Buchanan Dam which impounds Eastman Lake encompasses 235 square miles. The majority of this drainage area resides within the Y-M Region. The watershed is approximately 34 miles long and 10 miles wide ranging in elevation from 6,000 to 400 feet and terminating at the Buchanan Dam which is located near the Mariposa/Madera County line. The streams that supply the Chowchilla River flow in steep, narrow canyons that have slopes ranging from

approximately 1,000 feet per mile in the headwater area to 30 feet per mile near the reservoir area (CSWC, 2007).

2.8.1.3 Lower Mariposa Group of Streams

The Lower Mariposa Group of Streams includes Bear, Burns, Mariposa, and Owens Creeks and a variety of smaller creeks as shown on Figure 2-8. These major creeks all have DWR owned dams operated by the Army Corps of Engineers located near the Mariposa-Merced County line. Within federal lands, the section of Mariposa Creek above Mariposa Reservoir is considered an "Emphasis Watershed". Together with Agua Fria Creek and Stockton Creek, Mariposa Creek drains the largest area of the Lower Mariposa County group of streams with a drainage area of about 107 square miles. Upper portions of the Agua Fria Creek watershed drain the Mount Bullion area. Owens Creek drains part of the Catheys Valley and White Rock planning areas. The Bear Valley, Hornitos, and a portion of the Catheys Valley watersheds supply the majority of Bear Creek water (County of Mariposa, 2006).

2.8.2 Geology and Groundwater

2.8.2.1 Geology and Soils

Geology

The Y-M Region, located on the western slopes of the central Sierra Nevada Mountains ranges in elevations from 300 feet along the western portion and over 11,000 feet in the eastern, mountainous areas. The western portion is dominated by gently sloping foothills with generally thin soils above metamorphic bedrock. The northeastern portion is dominated by steep foothills and mountains.

Rocks found in the Region originate from marine sedimentation, tectonic subsidence and volcanic activity. The Sierra Nevada that frames the Region to the Northeast has developed out of the process of magma crystallizing below the surface, followed by erosion and uplift, with valleys being shaped from down dropping and glacier retreats that carved into the landscape. Bedrock in the western portion of the Region is dominated by a northwest-oriented grain.

El Capitan, Yosemite National Park
Credit: Kennedy/Jenks Consultants

The Region is divided by two major parallel fault and fracture zones that trend northwest-southeast. The Bear Mountains Fault Zone trends south-southeast crossing near the northwest corner of Lake McClure. The Melones Fault Zone closely follows Highway 49 through Bear Valley to Mariposa. It consists of a complex network of faults and fracture zones of several miles in width. This zone runs parallel to and is associated with the Mother Lode. Despite the Region's location along these fault zones, historic earthquake occurrences indicate a low probability of large magnitude earthquakes.

Major river drainages in the Region, running perpendicular to the Sierra Nevada ridgeline, have created deep canyons with steep slopes and cliffs in the eastern half of the Region. These features are generally susceptible to landslides and rock falls, which can be exacerbated where

development occurs along steepened slopes, such as Highway 140 from within the Yosemite Valley to the head waters of Lake McClure.

Several unique geological formations exist within the Region, including Bower Cave in the Stanislaus National Forest, Penon Blanco, located near Coulterville and the large rock formation of May Rock near Bear Valley. Undoubtedly, the most prominent and well-known feature in the Region is Yosemite National Park which is dominated by numerous granite peaks, including El Capitan and Half Dome. Most of the rocks in Yosemite consist of various types of granite, which are all part of the Sierra Nevada batholith. The straight, steep walls of the Yosemite Valley, popular for rock-climbing but atypical to glaciated mountain valleys, are a result of vertical fractures from glacial activity (County of Mariposa, 2006).

Soils

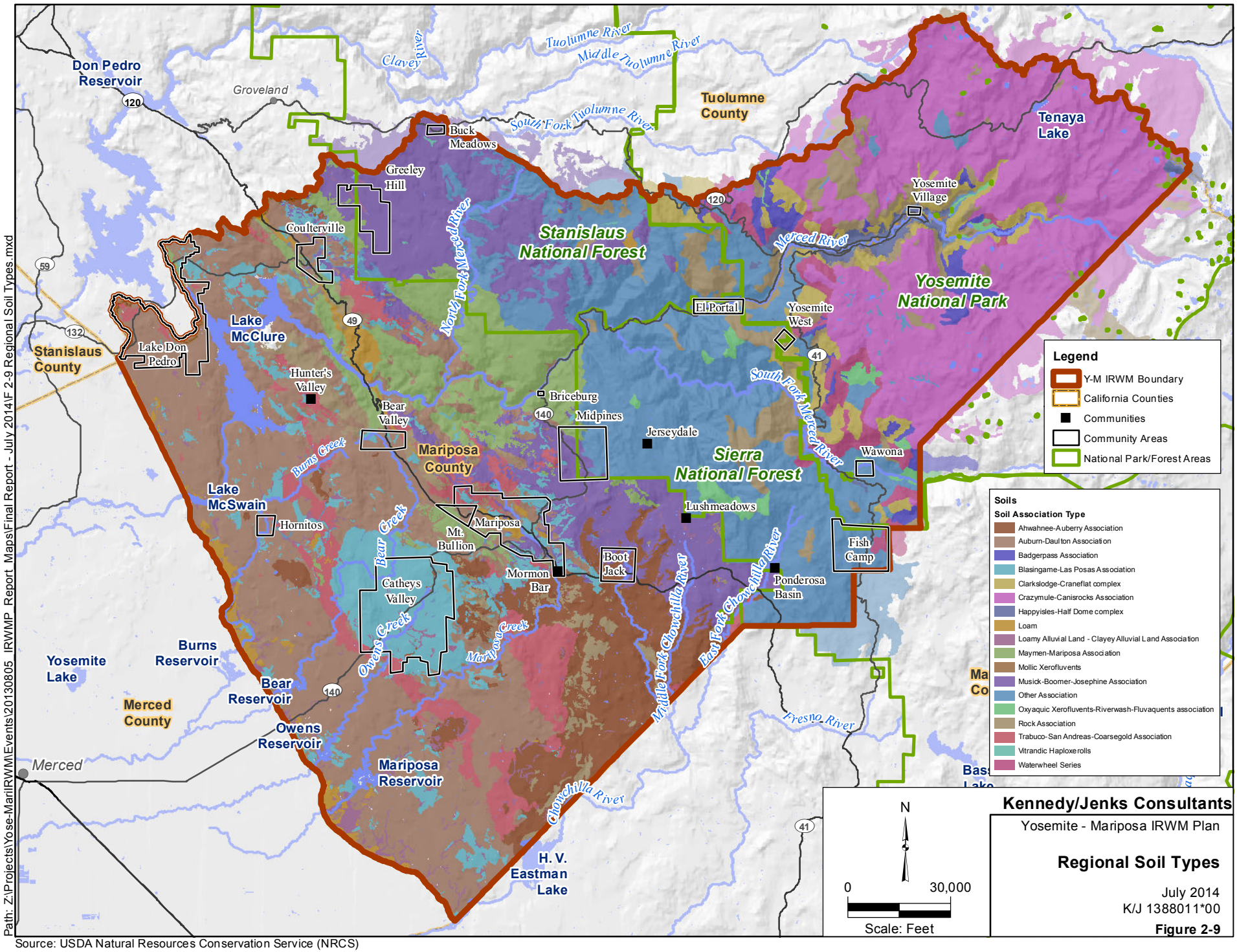
A soil survey conducted by the Soil Conservation Service in 1974 identified seven distinctive patterns of soils or land types, known as soil association types, in the County. These soil types are described in Table 2-9 below and shown in Figure 2-9.

Table 2-9: Summary of Soil Association Types in the Y-M Region

Soil Association Type	Description
Ahwahnee-Auberry Association	Covers approximately 14 percent of non-federal lands, primarily in the southeastern portion of the Region. The soil is generally well-drained, with gently sloping to very steep sandy loams originating from acid igneous rocks. These soils are often found in pastures, rangelands, and orchards, as well as some non-farm land uses.
Auburn-Dault Association	This soil association is found across approximately 42 percent of non-federal lands, in scattered locations throughout the Region. These well- to excessively-drained soils consist of gently sloping to very steep loams and stony loams formed from schist and slate. They are often used for cattle grazing.
Badgerpass Association	This association consists of gently sloping to steep soils found in mountain valley floors, along mountain slopes and ridge crests. Soils are moderately well drained to somewhat excessively drained and originate from alluvium and/or till derived from granitoid rock.
Blasingame-Las Posas Association	These soils are scattered throughout the Region, covering approximately 19 percent of non-federal lands. They consist of somewhat excessively drained to well-drained soils, of gently sloping to very steep loams and clay loams, formed from basic igneous rocks. They are often found under annual rangelands.
Clarkslodge-Craneflat complex	This association is made up of gently to moderately sloping soils, often found along mountain slopes, such as at mid-elevation areas in Yosemite National Park. Soil parent material is colluvium and/or residuum derived from granitoid and metasedimentary rock. Soils are well drained to somewhat excessively drained.
Crazymule-Canisrocks Association	This association consists of moderately to steeply sloping soils, often found along mountain slopes and flanks. Parent material is colluvium and/or till derived from granitoid rock. Soils are moderately well drained to excessively drained.
Happyisles-Half Dome complex	This association consists of gently to steeply sloping soils, found along mountain valley floors, mountain slopes and mountain flanks. Parent material is primarily colluvium and/or till derived from granitoid rock and some metamorphic, mafic rock. Soils are generally well drained.

Soil Association Type	Description
Loam	Loams range from stony, sandy loams to fine sandy and clay loams with gentle to moderate slopes, and in some cases, steep slopes. Soils are generally well drained. Fine sand loams are occasionally flooded.
Loamy Alluvial Land-Clayey Alluvial Land Association	This soil association is found in small valleys of the Region. The soils consist of well-drained to somewhat poorly drained, gently sloping to strongly sloping sandy loams to clays, formed in alluvium. These soil types are often used for annual range as well as for orchards and pasture at higher elevations. Soils are moderately well to well drained.
Maymen-Mariposa Association	This soil association is scattered throughout the northern part of the Region, covering about 11 percent of non-federal lands. These soils are used for limited range and woodland and consist of well-drained, moderately steep to extremely steep loams, gravelly loams, and gravelly silt from weathered schist and slate. Soils range from poorly drained to well drained.
Mollic Xerofluvents	This association primarily consists of El Capitan fine sandy loams generally found in mountain valleys and canyons on 0-2 percent slopes. Soils are somewhat poorly drained and frequently flooded. Parent material is fan alluvium derived from granitoid rock.
Musick-Boomer-Josephine Association	This association covers about 9 percent of non-federal lands in the Region, mainly in the east-central portion. This soil association consists of well-drained, gently sloping to very steep sandy loams, loams, cobbly loams, and gravelly loams from weathered basica and acid igneous rocks and schist. These soils are often used for woodlands and limited grazing.
Oxyaquic Xerofluvents-Riverwash-Fluvaquents association	Generally found in mountain valleys or canyons, this mesic association originates from coarse textured stream alluvium, derived from granitoid rock. The soils exhibit minimal slopes of 0-2 percent. Soils range from very poorly drained to somewhat excessively drained.
Rock Association	This association is dominated by rock outcrops and complexes with large percentages of rock along moderate to steep slopes. Parent material is granitoid rock and colluviums derived from granitoid rock. Soils can be somewhat drained to excessively drained.
Trabuco-San Andreas-Coarsegold Association	These soils cover approximately 9 percent of non-federal lands in the Region, with mainly Trabuco soils in the northern part and San Andreas and Coarsegold soils in the southern part. These well-drained soils contain gently sloping to steep clay loams, very fine to fine sandy loams, formed from basic igneous rocks and mica schist. They are generally found under pastures and rangelands.
Vitrandic Haploxerolls	This association consists of gently sloping sandy soils found in mountain valleys and canyons. Parent material is coarse textured stream alluvium derived from granitoid rock and reworked lake sediments. Soils are well drained.
Waterwheel Series	This association consists of moderately to steeply sloping soils generally found along mountain slopes. Parent material is colluviums derived from granitoid rock. Soils are well drained to somewhat excessively drained.

Source: Soil Conservation Service, 1974; USDA, NRCS, 2007.
Note: Various soils fall under an “other” category and were not described in this table.



Source: USDA Natural Resources Conservation Service (NRCS)

Soil characteristics can vary significantly in the Region and are important in determining the viability of human- related activities. Soil erosion rates, permeability and shrink-swell potential can affect potential groundwater recharge, agricultural productivity, septic tank functionality and development potential.

Septic tanks are commonly used in the Y-M Region. Generally, these systems consist of a tank with leach field where wastewater filters downward through the soil. Proper functioning of these systems is highly dependent on site-specific characteristics, including slope, soil depth, and soil permeability. In an effort to better identify septic suitability, the Model Mountain County Development Program, prepared by Mariposa County during 1979 and 1980 to evaluate physical development constraints (Mariposa County, 2006) inventoried soil depth and permeability in the Region. The inventory assigns septic suitability classifications from A-D which correlates to minimum, moderate, high and extreme constraint characteristics. A more constrained suitability classification requires additional planning to be conducted prior to installation of the septic system or a septic system at that location may not be recommended.

According to this inventory, very limited areas in the Region demonstrate the proper combination of soil depth and permeability to meet the septic suitability classification A (minimum constraints). Due to the rugged terrain and soil characteristics found in the Region, particular precautions are taken by Mariposa County Environmental Health to ensure adequacy of such septic disposal systems, and proper protection of environmental resources and public health.

The shrink-swell potential of soils is an important characteristic for planning development projects, as significant shrinking and swelling can result in property damage and potential human hazards. The majority of soils within the Region have low to moderate shrink-swell potential.

Soil erosion is a natural process and erosion rates can vary with slope and soil characteristics. Human activities can impact natural erosion processes and in the Region, wildfire is one of the main factors contributing to soil erosion. Another important factor is construction-caused soil erosion, which has largely been controlled by a County grading ordinance. Accelerated erosion can also occur around steep slopes and erosive soils and rocks, particularly granite slopes, commonly found in the Region.

The erosion potential of soils within the Region have been inventoried in the Model Mountain County Development Program, which is shown in the table below.

Table 2-10: Erosion Potential in the Y-M Region

Erosion Potential Category	Acres	% of Total
Minimum	69,714	14.79%
Moderate	21,502	4.56%
High	221,823	47.05%
Extreme	158,374	33.60%
Total Acreage	**471,413**	**100.00%**

Source: Mariposa County General Plan (Table 8-5), originally from Model Mountain County Development Program Document 1, Development Constraints Report, August 1980.

2.8.2.2 Groundwater Resources

Groundwater resources make up the majority of the Region's water supplies, however, the small Yosemite Valley Groundwater Basin is the only DWR-designated Bulletin 118 groundwater basin in the Region. The majority of the Region's groundwater supplies originate from hard rock wells in the plutonic granites of the Sierra Nevada. The Region's groundwater flow is governed by the granitic terrain of the overall landscape. The overlying soil mantle thereby acts as a filtration and

containment system, facilitating percolation and subsequent recharge in the fissure crack system, and serving as a temporary water reservoir. Specific granitic groundwater basins in the Region, however, have not been studied in depth.

Observations recorded from well drilling and hydrogeologists provide valuable insights into the average characteristics of Sierra hard rock wells found in the Region as follows (County of Mariposa, 2006):

- Wells have a mean depth of 115 feet, with an average pump depth between 50 to 100 feet.
- The average estimated yield is three to five gallons per minute (gpm) and most wells serve between two to three people. However, domestic well drilling is usually stopped when 5 to 10 gpm are obtained. It is possible that larger yields, greater than 50 gpm, could be obtained in some locations.
- Geologic observations indicate a rapid decrease in rock permeability and therefore water production with depth. As a result, domestic wells are preferably less than 150 to 250 feet deep, however the optimum depth of water wells in crystalline rocks is largely determined by economic factors.
- In the absence of geological and geophysical guidance, drilling in crystalline rocks can encounter highly variable amounts of water. In unweathered rock, 5 to 15 percent of wells are failures and roughly 10 percent will have yields of 50 gpm or more.

Metamorphic formations found in the Region can also contain useable groundwater resources and show high hydrologic versatility. Highly fractured zones in the Sierra Foothills are known to carry large amounts of water. The permeability of these rocks is a result of its joints, faults, and bedding plane partings. Highest well yields tend to occur in or near broad ravines as a result of associated joint systems and fault zones.

Groundwater is used in the Yosemite Valley, Wawona, and El Portal areas for domestic water supplies and for park visitors within the National Park. Existing uses indicate that the groundwater resources of the Region's mountainous areas have the potential to provide high quality drinking water for residential customers. There are some areas however, within the Region that contain some water quality challenges. Groundwater resources, for example, in some parts of the Catheys Valley planning area have been found to contain elevated levels of nitrates in the upper 50 to 100 feet of the water bearing unit, which has been attributed to historic turkey ranches (County of Mariposa, 2006).

Overall, geologic strata within the Region are not conducive to the formation of large groundwater basins. In addition, information regarding groundwater availability and quality in the Region is generally lacking. More detailed studies of the groundwater basins and analysis of existing data are necessary to provide improved knowledge of present groundwater conditions and potential trends for long term planning purposes. A focused hydrogeologic study of some areas within the Region will be prepared in parallel with the preparation of this IRWM Plan.

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